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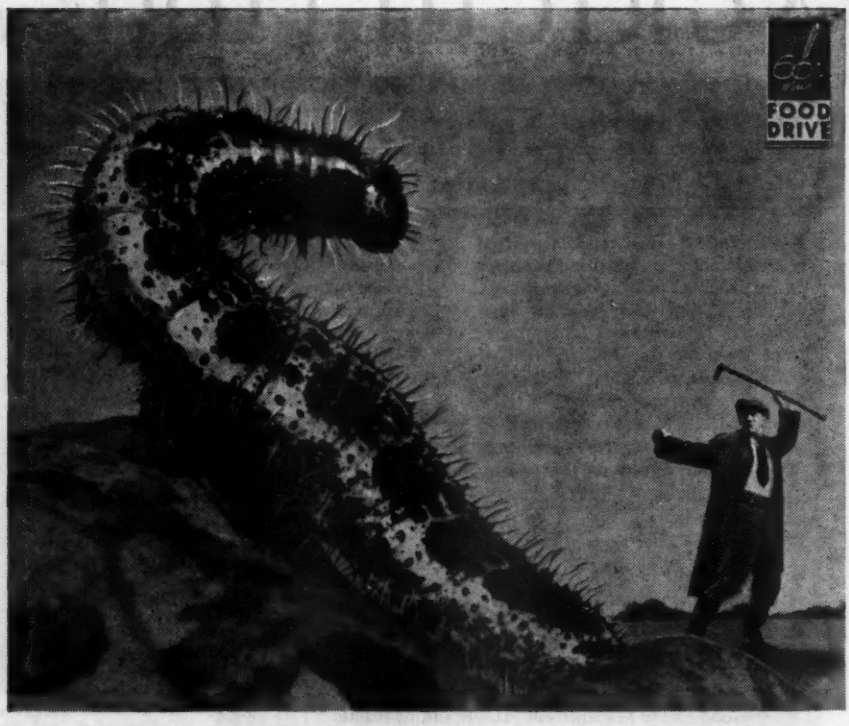
Cover Photograph

The village of Poynings in Sussex, with the South Downs beyond leading to Chanctonbury Ring



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AGRICULTURE

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

VOL. LXI No. 3 JUNE 1954

ELECTRICITY IN CROP PRODUCTION

R. LESTER STEYNOR

Bromesberrow Heath, Gloucestershire

The possibilities of utilizing electricity on a small farm are well shown on Mr. Steynor's cash cropping enterprise in Gloucestershire.

A RECENT demonstration on my farm focused attention on the many little ways in which electricity can be utilized about the place, apart from its more obvious uses in the farmhouse itself. It is, in fact, a sore point with the authorities that so many farmers cry out for a supply and, when connected, fail to make full use of its potential. My 100 acres in Gloucestershire are devoted solely to the production of apples, corn and potatoes, without livestock, and my experience of electricity is confined to this programme. It is, in a way, a modified form of market gardening; all produce is sold off and all manures bought in. It has not, however, the complications of a horticultural holding, since I have no glass and have given up vegetables. One advantage of this simple enterprise is that, freed from the tie, the worry, and the feeding, breeding and health problems of livestock, a man has time to devote to the fewer problems that remain—in my case those of actual crop production, storage and sale, with attention to the details of suitable buildings—and time, perhaps, in which to live!

Mains electricity arrived here seven years ago. I welcomed it, not in the hope of a *cheaper* form of light, heat and power, but for the vastly better lighting it offered, the cleaner and more convenient form of heat, the reduced fire risks, and the more reliable power, especially in the small units. Apart from these advantages, there is a great saving of labour, and it is here that the true economy lies. Lastly, the greatest benefit is gained from the generally improved conditions of work—an important point these days.

Each light, power point and machine installed has been selected on its estimated merit: none has been adopted for the sake of electrification. In this process of critical appraisal, some items were never bought, some have since been altered, and a few have been scrapped.

Lighting Every light but two (owing to lack of space there) in the buildings has been carefully shaded. I am all against shining light in the eyes; the right direction for light rays is upon the object. Many lighting positions have had to be moved to avoid throwing the shadow of a worker's head on to his work. Garages and tractor sheds have an extra lamp at the rear to light up mounted implements for morning adjustments. Every fixed

machine has a light over it, hung low. Portable machines, like potato graders, carry their own lights with them. I don't skimp the wattage, for lighting is relatively economic of current, but you can safely cut down the power of a lamp when it is placed near the work, in a small room, or by whitening walls and ceilings. When a building has two entrances, I have a switch at each doorway, each lighting one or more lamps in the room. I prefer this to two-way switching, where each manipulation sinks to the level of an experiment to discover if the trigger should be moved up or down!

I like the translucent plastic shades which, in addition to throwing the light downwards, allow some of it to pass through to be reflected from walls and ceilings. Unfortunately, this type of shade becomes brittle with heat. The opaque metal reflector type may be bright underneath but the yawning blackness above it sharply limits the range of vision. Some of these "black-out" shades even have two heat-escape holes at the neck, but they give a harsh light to the eyes when used low over a machine. This kind, although good, and having the added advantage of being unbreakable, is better used at a higher level.

I use fluorescents only where I need a lot of light without shadows; over my apple grader and workbench, for instance. I have just removed a "warm" fluorescent from my office because of dazzle.

I have placed coloured indicator lamps about the buildings to tell me when certain fixed machines are at work, and other lights to tell me when a machine is not working. One machine has two lights, so it has to behave itself! A central tower on the old "Tithe Barn" carries a beacon of 300 watts which facilitates moving around on a dark night. A portable distribution board on a 50-yard, rubber-covered flex enables me to carry up to 5 amps (1,100 watts) beyond the confines of the buildings. In palmier days I have operated this extension for floodlighting the swimming pool, but in more sober mood it can be put to good use with small power tools, like drills and wire brushes, when at work on a high roof. Privileged visitors may also witness a green shaded light descend 137 feet down my disused (now dry) well! I believe this is the only "frill" on the place.

Heating In considering electricity for heating we are on more difficult ground. I have no figures, but in some cases I believe electricity to be dearer per unit than other forms of heat, and that, considered nationally, it is a wasteful conversion of power. It is the way it is used, with proper insulation, that turns the scale in its favour, coupled again with a notable saving of labour. I have a feeling, but no experience, that where an electric appliance calls for a large amount of current (say, 12 kilowatts), one should think seriously of an alternative form of heating. Apart from a warm mess-room for the men and hot water for washing, I use heat mainly for keeping frost away from the potato stores. I have both tubular and 3kW. fan unit heaters, all thermostatically controlled.

The allied subject of insulating farm buildings has interested me for many years, and when we changed over from oil to electricity most of my stores were already insulated. My first attempt, nearly twenty years ago, to lag a building was on a low-built Dutch-barn type of shed that I wanted to use for seed potatoes and, later, for bagged ware. The walls were simply timber framed, clad with rebated weather-boarding, and lined with ½ inch matching: a 4-inch cavity was filled with dry deal sawdust. When the boarding failed to keep out rain from the filling, I changed it for corrugated iron. The roof was dome-shaped, so at eaves level I slung a ceiling of pig wire carrying two tons of straw. This gave me 10 feet of headroom inside. The rats

were always rustling about in this straw, so I took it away and substituted two layers of old bags covered with a 3 inch layer of deal sawdust. Insulated like this, I found that one oil heater kept frost out of the 14,000 cubic feet so that 80 tons of produce could be housed in safety. Nowadays, I set the thermostat at 36° F. and forget about it.

My galvanized iron tractor sheds have very low roofs (giving only 7 feet of headroom) and are lined with "nailable" asbestos sheets, the cavity being filled with straw. A large bag-mending room nearby is lined for comfort of working with the same material on the walls, which are sawdust-filled, while the corrugated iron roof has a felt and straw lining. I would not repeat this, however: the lighter colour of insulating board, which can be primed and cement-painted, is much preferable. I had not used the manufactured slab insulators until recently. These have lately come on the market in great numbers in a variety of ingenious materials. They are more expensive per square yard than improvised insulation with waste materials, but they are easier to erect. I ceiled the apple cold store with slab cork, but, because of its dustiness, I shall never do this again. The insulating board we put below it was a joy to use and made a white ceiling. When no one was looking, I filled the cavity between ceiling and board floor above with half a ton of old sacks. The capital cost of converting this farm building into a 25-ton capacity cold room worked out at 8s. a bushel. I believe this to be a very low figure, and I would not mind repeating it. During the warm autumn I noticed the compressor motor working long hours, and I feared a big bill for current. With the corresponding saving of heating in the buildings, I was glad to find there was no rise, compared with the same quarter the previous year.

The chitting sheds for seed potatoes are merely insulated buildings with added roof lights. Apart from frost safeguard, extra heat can be used to bring along a backward variety like Ulster Prince, or to hurry along the chitting of early seed delivered late. I use these chitting rooms for apple packing in the autumn, thus economizing in space. As my fruit acreage rises and the packing season extends into the spring, so the potato acreage will fall and the space for chitting seed will be less, thus maintaining the balance.

The principle of warming only a confined space is best exemplified in the car engine heater; 100 watts placed there on a cold night will give quicker starting than several kilowatts used to heat up the whole of even an insulated garage. In two instances I have used straw bales for walling, but have discarded both efforts. My first was an improvised tractor shed during the war, which was all right until the insurance agent spotted it! When I removed the bales at his suggestion, I was amazed at the extra width I gained under the same roof. This same space factor I applied to the indoor potato sheds, where I store up to 300 tons in bulk instead of using the old clamping method. The outside walls of these buildings are of galvanized iron down to the ground, a cavity of 4 inches is filled with deal sawdust, and an inner lining wall—not of straw bales, but of 4½-inch brickwork—is well tied into the timber uprights. The potatoes are stacked to 7 feet high. I use no heat in this building, but good lights are a help because the barn is "blacked-out" against draughts.

Apart from good insulation, thermostats are a great economy. But one must be careful to set them only just high enough, and constantly to see that they are not tampered with. They might, with advantage, even be locked. Draughts must, of course, be excluded. In practice, this is difficult and needs a degree of close fitting in doors and eaves not usually found in farm buildings.

Power Tools and Machines Power units are familiar to most people, but a brief inventory will illustrate their scope on my small place. A 7½ h.p. motor drives a 30-inch circular saw in wet weather for cross-cutting logs. It will also rip planks and quarterings. The 3 h.p. hammer mill grinds corn for sale and earns its keep. This unit is most labour-saving if it is conveniently arranged for flow of corn to the hopper and for ease of bagging off. The apple cold store has a 3 h.p. fully automatic unit. Of the smaller motors, I have two on the potato graders. These should be fitted above the machine, but if below the riddles they must be encased to exclude dust. The apple grader runs on ¾ h.p., but the geared motor has been unbolted from the frame, where it used to hum, and hangs by its rubber V belt drive, with extra springs below for tension, and between rubber blocks. It is now silent.

The rest of my electrical gear consists of power tools in the workshop. These comprise a 10-inch circular sawbench of 1 h.p., a tarplaner or powered handplane, woodworking lathe, bench grinder, bench and portable drills, a flexible drive for drill or brush, portable sander or wire brush, and a hedge-trimmer. I was warned I should need a slow-moving grindstone with geared motor, costing in all £60. Instead, and for less than half that, I obtained a 1 h.p. bench grinder of 2,800 r.p.m. with coarse and fine stones. Yet, for all the warnings, I have for the past seven years sharpened my penknife, chisels and planes without burning the metal.

A water softener that runs for 4d. a year, and a battery charger, are two little luxuries that electricity has brought me, and I would not be without either. Several clocks installed in the early days behave better than they used to.

Running and Installation Costs Our current is 230 volts a.c. single-phase. Phasing is outside the scope of this article but in practice we can start all our motors without trouble, and only the larger units are appreciably dearer to buy than three-phase motors. Mine give full power once started. The capital cost of installation and all farm equipment was around £1,500 and the cost of the power used amounts to £65 a year. This figure, however, includes the cost of a 2 kW. heater in the office, which is a boon. The first 400 units in every quarter are charged at 4d. and the rest at 1d. Allowing 5 per cent depreciation, 2½ per cent interest on capital (that is, 5 per cent on half the capital, or rather on the average outstanding while it is being repaid) and annual consumption, the total cost works out at the equivalent of 2¼ man-days a week—on a 7-man holding.

There are, of course, innumerable ways in which I could still further utilize the power to hand, such as low-voltage soil and water-pipe warmers, and no doubt each will be considered in turn upon its merits. At the moment I think I have enough equipment to go on with, and I am very happy with it.

* * *

The boon of electricity is appreciated equally in the farmhouse as in farm buildings. We therefore asked MRS STEYNOR *to speak for herself.*

In the Farmhouse People frequently ask, "Which gadget would you do without *first* in the home?" I suppose the only "frills," as my husband calls them, are the mixer and the floor-polisher—and the dishwasher, if I had one. In this country they don't seem to make the horizontally-loaded model I want, so I am still waiting. But I think you need a family of at least six to make it worth while. We have few polished

floors, so the polisher is a real luxury; if I were buying another I should have the lightweight kind with the interchangeable pads for furniture as well as floors. Of course a vacuum cleaner was a "must" from the start.

One takes the electric lights for granted—but what hours of work they save, compared with the cleaning of oil lamps—especially when a guest has left a lamp untended and it has had a good "smoke"! And the fire danger, with children tearing up and down in an oil-lit house, was always a nightmare.

We were really fussy about heaters. We refused to have anything but convectors with triple switch-control for 600, 1,000 and 2,000 watts. Here again, there is no danger of fire or electrocuting oneself. Guards on open electric fires are now compulsory—but a flimsy party frock or nightdress can still catch fire by brushing too close; and small, inquisitive fingers can still poke through the few wires of the standard guard.

A 15 cubic feet refrigerator to act as a larder is another "must" in this house, as the kitchen is a hot room facing south-west, with no larder at all. Before we bought the refrigerator we had to use the old dairy, which is at the other end of an intervening room; so this saves both time and temper!

The household water, which is piped to the automatic clothes-washer, is heated by thermostatically-controlled immersion heaters. My husband worked out that the *whole* of the household electricity bill for a year was equal to the cost of the anthracite and the odd-job-man's labour for hot water *alone* in the old days—and then the water was often either stone cold or literally red hot with the rust it brought out of the pipes.

The hair-drier, portable airer, and sewing-machine motor are probably luxuries, but I wouldn't be without them.

A leaflet on rural electrification, *Electricity for Farm and Estate* (Fixed Equipment of the Farm Leaflet No. 20), has recently been issued by the Ministry. Copies may be obtained from sale offices of H.M. Stationery Office, or through any bookseller, price 9d.

Editor

AUSTRALIAN BEEF

2. EXPORTS AND THE FUTURE

C. W. STRUTT, B.SC. (AGRIC.)
Agricultural Adviser, Office of the High Commissioner for the United Kingdom, Canberra

The Prospects for increased beef production in Australia and, with it, higher exports, are very good.

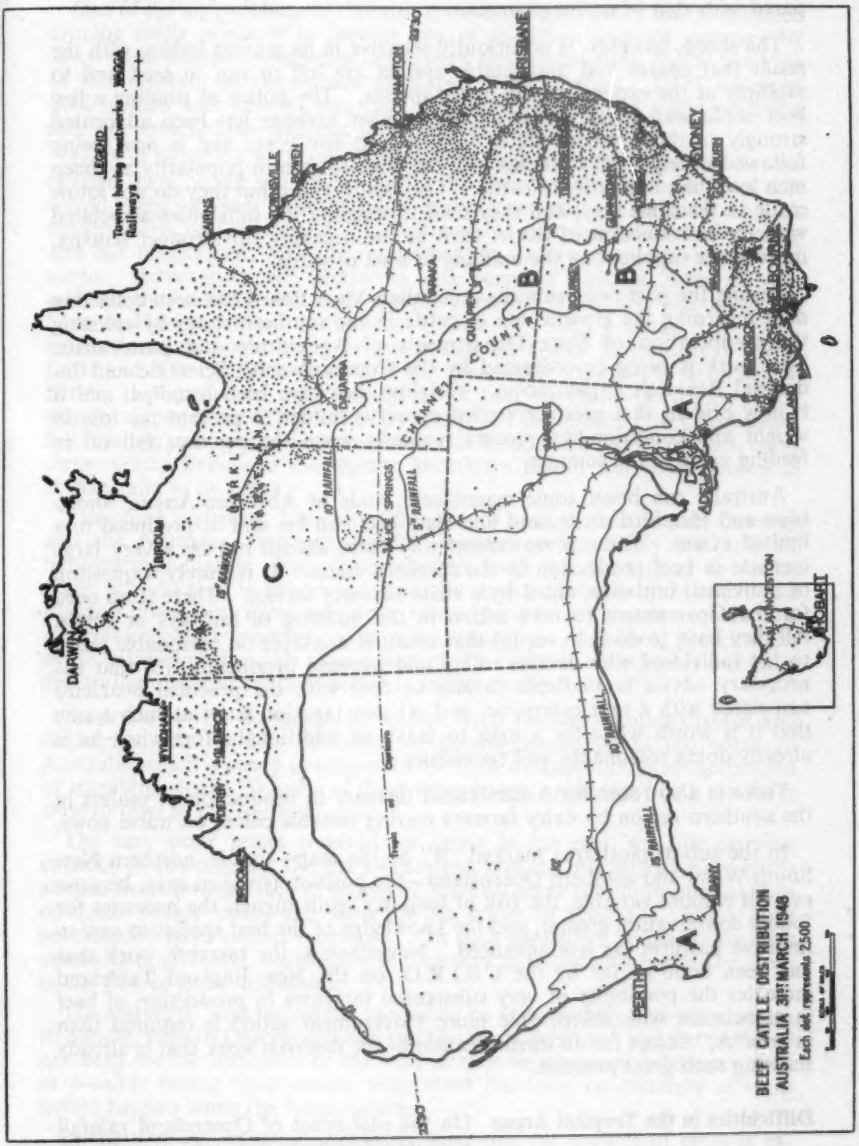
BEFORE the war Australia exported about 20 per cent of her total production of beef and veal, but over the last three years the proportion has dropped to an average of only 11 per cent. Queensland is responsible for about 80 per cent of beef exports. But although Australia ships such a small proportion of her total beef production, the export price is of vital importance because it sets the floor to the market. The testing time for the industry is now approaching, when bulk purchase by the Ministry of Food ceases. Under the Fifteen Year Meat Agreement the United Kingdom has agreed to take all Australia's exportable surplus of beef, veal, mutton and lamb and to provide a satisfactory market for it. Australia, for her part, has undertaken to promote development programmes to bring about steadily increasing exports of meat to the United Kingdom.

Chilled Beef and Canned Meat Australia exported up to 35,000 tons of chilled beef per year before the war, but apart from a trial shipment of 100 tons a few months ago, she has sent none since. However, the experiment proved very successful, and Australian shippers have been offered a bonus of £25 per ton by the United Kingdom for all suitable meat shipped chilled. But to enable this trade to be renewed on a large scale, a great deal of preliminary work is involved, not only at the meatworks to make them capable of shipping chilled beef, but still more amongst producers.

To this end, a new class for baby beef was included in the Ministry of Food schedule this year, whereby a bonus of 2d. per lb. is paid for all suitable carcasses within a weight range of 400–720 lb. dead weight. At the same time, a penalty of 1d. per lb. is imposed on all heavyweight carcasses over 880 lb. dead weight. The combination of these two alterations in the schedule should provide a powerful stimulus to producers to market their cattle younger and to adopt methods that will avoid the succession of checks in growth that have been characteristic of the life history of so many beef cattle in Australia in the past.

There has been a marked increase in the production of canned meat in recent years, because of the favourable prices obtainable on the trader-to-trader basis, particularly on the United Kingdom market. However, the glut of canned meat supplies in Great Britain has forced a substantial reduction in the trade lately.

Southern States and Sub-tropical Potential I have said a good deal about the present pattern of production in Australia. But what are the prospects for the future? In examining the possibilities, it is convenient to divide the Continent into the three sections marked "A," "B" and "C" on the map opposite. Beef production in the areas marked "A" on the map is not difficult. The necessary research and demonstration work has


LEGEND
Towns having meatworks
Railways
BEEF CATTLE DISTRIBUTION
AUSTRALIA 31st MARCH 1948
Each dot represents 2500
BRISBANE
SYDNEY
MELBOURNE
ADELAIDE
PERTH
DARWIN
HOBART
LAUNCESTON
CAIRNS
TOWNSVILLE
ROCKHAMPTON
ALICE SPRINGS
BROOME
WYNDHAM
DERBY
TROPIC OF CAPRICORN
A
B
C
10" RAINFALL
15" RAINFALL
20" RAINFALL

been done with legumes and species of introduced grasses, so it is comparatively easy for a farmer to lay down a paddock to improved pasture with every prospect of at least doubling his stock-carrying capacity, compared with that of native pastures.

The sheep, however, is notoriously selective in its grazing habits, with the result that coarse and unpalatable species are left to run to seed and to multiply at the expense of the better species. The policy of running a few beef cattle with sheep to eat off the rougher herbage has been advocated strongly in the southern states for the past few years and is now being followed widely. This practice will continue to gain in popularity as sheep men lose their antipathy to cattle. They know sheep but they do not know cattle in the same way, and they tend to magnify the difficulties associated with the introduction of cattle, such as the necessity for stronger fencing, more water supplies and the building of a set of yards.

During the past two years the Australian Meat Board has been collecting data regarding the growth rate of cattle in the southern states by enlisting the co-operation of State Departments of Agriculture and pastoralists. This work is being co-ordinated by the Commonwealth Scientific and Industrial Research Organization. Weighbridges have been installed, and it is now evident that producers must conserve fodder to prevent the loss in weight and condition that occurs regularly when the pastures fall off in feeding value in the summer.

Australia can boast some magnificent studs of Aberdeen-Angus, Shorthorn and Hereford cattle, and first-class beef can be, and is, produced to a limited extent. There is no reason why there should not be a very large increase in beef production in the southern states. It is purely a question of individual initiative, aided by a virile advisory service. There is no need for the Government to take action in the building of railways or roads. All they have to do is to see (a) that credit is available on reasonable terms to the individual who decides to try and increase production, (b) that the necessary advice is available to him to deal with the practical problems associated with a new enterprise, and (c) that taxation is set at such a rate that it is worth while for a man to make an additional effort when he is already doing reasonably well financially.

There is also room for a substantial increase in production of vealers in the southern region by dairy farmers rearing suitable calves on nurse cows.

In the sub-tropical area marked "B" on the map—that is, northern New South Wales and southern Queensland—the position is not so easy, because rainfall is more variable, the risk of long dry spells higher, the necessity for fodder conservation greater, and the knowledge of the best species to sow to improve pastures far less advanced. Nevertheless, the research work that has been done so far by the C.S.I.R.O. on the New England Tableland indicates the possibility of very substantial increases in production of beef in association with sheep. No more Government action is required than in area "A," except for an intensification of the research work that is already showing such great promise.

Difficulties in the Tropical Areas On the east coast of Queensland rainfall is reasonably high, but until recently research had not found grasses and clovers which could be recommended confidently to give better yields than the native grasses. However, considerable progress has been made by the C.S.I.R.O., and the introduction

of Rhodes grass, *Paspalum scrobiculatum*, and species of *Stylosanthes* has altered the picture.

One of the big problems of this area is the cattle tick, which has necessitated dipping cattle regularly to prevent loss of condition through worrying by ticks. For some time, arsenical dips were used successfully, but now a type of tick resistant to arsenic has developed in some areas. DDT has been used instead with success, but there are indications that in a few years the tick will have become immune to this product also!

In 1932 the C.S.I.R.O. introduced some Zebu bulls from the U.S.A. and crossed them on the station cattle with the object of developing a beast that would carry sufficient Zebu blood to enable it to resist the tick and the high temperatures of Queensland. Unfortunately, adequate control of mating was not maintained, with the result that the Zebu crosses got a very bad name. However, certain producers have persisted with the Zebu, and are satisfied that a beast with three-eighths Zebu blood and five-eighths Shorthorn or Hereford blood is the ideal to aim at. Such a beast, they claim, reaches market weight one year earlier than pure-bred Shorthorns or Herefords and is not difficult to control if a reasonable standard of animal husbandry is practised on the property. Last year the Santa Gertrudis, which was developed at the King Ranch in Texas, was introduced into Queensland, but it is too early yet to judge whether this breed, which does, in fact, carry three-eighths Zebu and five-eighths Shorthorn blood, will be as successful in Australia as in Texas.

Travelling westward from the Queensland coast to the Channel Country and the Northern Territory, rainfall becomes progressively less and air temperatures higher. Very little research work has been done so far as plant introduction is concerned, and the native pastures of Mitchell and Flinders grasses can carry only up to sixteen head of cattle to the square mile on well-improved property. The drier atmosphere, however, prevents the cattle tick from being able to complete its life cycle, so that there is a definite line to the west and south of which is clean country.

Australia is very fortunate to be free from foot-and-mouth disease and rinderpest, but there is the curse of pleuro-pneumonia in the north of Australia which is costly to control in the form of inspection and vaccination of travelling stock. In spite of these precautions, epidemics break out from time to time in the southern states.

The very poor prices received for cattle in the past, the low carrying capacity of the country, the risk of drought, and the inability to move cattle at such times through lack of transport, have all led to the enormous holdings of 5,000 square miles and more in the north of Australia, which have necessitated large capital resources. On such properties animal husbandry generally is primitive, although a few owners have shown what can be done in the face of great difficulties.

The system of land tenure has proved to be an extremely difficult problem to handle, both in Queensland and the Northern Territory, and the tendency has been for the occupiers of the land to take as much out of the property as possible during their tenure, since there has been no certainty of what would happen when the leases expire.

In the tropical regions of northern Australia, the growth of grass is extremely quick after rain, and it is so sappy that it does not have a very high food value. As this herbage dries off, the cattle start to put on weight but, as hardly any rain falls from the beginning of April to the end of November, the cattle subsequently lose condition rapidly. The result is that the life

cycle of a typical bullock on a property in the Northern Territory shows quick growth whilst suckling, a fall in weight after weaning, a rise in weight the following year after the rains, with a further loss in weight until the next rainy season starts. This process is repeated with variation according to the season, until eventually, at the age of four to six years, the bullock reaches marketable weight. Such beef cannot be really first class in quality when compared with that from cattle which reach the same weight at 2½ years old and have suffered no check in growth from birth.

The North as a Breeding Centre It is quite clear that the solution is not to try and fatten cattle in the north. If the policy were to breed cattle there and transfer them as young stores or as weaners to the coastal district of Queensland, where fattening can be carried out much more efficiently, the rate of turn-off from the properties would be increased substantially, thus enabling a bigger herd of breeding stock to be carried.

This policy, however, comes up against the tremendous problem of transport. A beast cannot walk long distances until it is at least two years old, and a glance at the map will show that at present the railway system in the north of Australia is entirely inadequate. If a railway were built from Dajarra, the western terminus of the railway line from Townsville, across the Barkly Tableland to Newcastle Waters in the centre of the Northern Territory, it would improve the situation considerably. This has been recommended by successive Royal Commissions for the past twenty-five years or more, but so far nothing has been done.

This, then, is the field where Government—both State and Federal—could assist the beef cattle industry immensely. It would then be up to the individual to improve his property by subdivision into paddocks, so that the bulls could be turned in with the breeding herd at such a time that calving would take place at the most favourable period of the year. Cows with calves at foot could then be separated from the rest of the cattle and would have access to the best pasture.

The subdivision of properties and the sinking of bores would cost a great deal of money but, if the cattle could be got away as stores at 1½–2 years old, the rate of turn-off would be increased from its present average figure of about 10 per cent per annum.

As an alternative to the heavy capital cost of building a railway, there is the possibility of using large freighter aircraft to fly out weaners to the railhead or direct to the fattening properties in the Channel Country. This would involve a Government subsidy, because of the high direct operating costs of aircraft, but it is probable that the cost to the taxpayer would be far less than the interest on the capital needed to build the railway.

A further suggestion that has much to recommend it is the building of small abattoirs at strategic points inland, and the flying of the chilled meat to railhead with subsequent transport to the coastal meatworks in refrigerated vans.

Whatever the final decision as to the best plan to adopt, the fact remains that, before there can be any substantial increase in production from this area, there must be Government action, both Federal and State, to improve transport. When this is done, I feel certain that there will be plenty of people with the pluck and the drive to carry out the fundamental improvements on their properties, without which good animal husbandry is impossible and output must remain low.

SAVING MONEY ON SEED POTATOES

E. R. BULLEN, B.Sc., and C. V. DADD, M.A. Dip.Agric. (Cantab.)
National Agricultural Advisory Service, Eastern Province

This problem is reviewed against the background of experience and experiment in the Eastern Counties. In many areas, the wider use of good home-grown seed seems to offer the best opportunity for economy at the present time.

THE potato crop is an expensive one to grow and most farmers recognize that it is only profitable if good yields can be attained. They realize, too, the risk of reducing yields by planting seed infested with virus diseases. Because of this, about two-thirds of the maincrop potato acreage of the ten counties in the Eastern Province is planted with seed produced in other areas. Most of this seed comes from Scotland or Northern Ireland, and the cost is £3 million a year. Potato seed can cost nearly as much as labour in the almost growing of a potato crop; according to the 1951 survey made by the Cambridge University Farm Economics Branch(1), labour and seed amounted to 32 per cent and 24 per cent respectively of the costs of production. Compared with the ingenuity being devoted to mechanization to reduce labour requirements, relatively little thought is being given to possible methods of reducing this seed bill.

Reducing the Seed Rate The amount of seed required to produce a potato crop can be reduced either by planting smaller seed tubers or by planting normal-sized seed at wider spacings than is customary. Since the farm implements do not normally allow for much variation in row width, the second method necessitates planting further apart in the row. Both methods may reduce the total (as opposed to the ware) yield of the crop.

Many experiments have shown clearly that any reduction in seed rate below 15–20 cwt. per acre gives a reduction in the total yield. For practical purposes it is immaterial whether the seed rate has been reduced by planting smaller seed or by planting at a wider spacing. The important point is that an insufficient weight of seed is being planted to maintain the yield. However, most farmers are generally more concerned with ware yield, as sales of ware represent the main income from potato growing.

Experiments by Findlay and Sykes(2) with King Edward potatoes on a silt soil in west Norfolk show that, while the *total yield* fell when the seed was planted more than 12 inches apart in 29-inch rows, the *ware* yield was not affected significantly by planting seed up to 21 inches apart. Three sizes of seed were used in these trials: 1¼ inches × 1⅝ inches, weighing about 1 oz. per tuber; 1⅝ inches × 1⅝ inches, weighing about 1½ oz; and 1⅝ inches × 2 inches, weighing about 2 oz. There was some indication that, using larger seed, a wider spacing in the rows had less influence on yield than was the case with the smaller seed. Other trials have confirmed that ware yields are not materially affected by varying the distance between seed tubers within reasonable limits. On this evidence, sound seed of reasonable size can be planted up to 20 inches apart without seriously affecting the yield of ware. Where close spacing has been practised, some economy is possible in this way.

There is little precise information on the effect of soil fertility, variety, planting date and sprouting of seed on the optimum plant density for main crop potatoes. More work on this problem would be valuable.

The use of small seed (for example, "thirds") can give useful yields under good conditions: it is interesting to note that the seed used in the Netherlands

is generally close-graded and smaller than that used in this country. Findlay and Sykes recorded significant reductions in both total and ware yields from using their 1 oz. sets, but allowing for the small quantity of seed needed, it might sometimes prove economic to use such seed at rates of 8–10 cwt. per acre. The most cogent objection to very small seed is its unreliability in unfavourable circumstances, such as poor soil conditions, weedy fields, or if late frosts should occur.

Cutting Seed Seed is rarely cut in the Eastern Counties, and many farmers are strongly opposed to the practice. In contrast, cut seed is used extensively by American potato-growers. One factor which may be responsible for the prejudice is experience of planting cut seed in a dry tilth. However, the use of a potato planter conserves soil moisture during planting, and the increasing use of these machines may be an important factor in enabling cut seed to be used in the future. In very wet soil cut seed is liable to rot, but such conditions are unusual in the potato-growing areas of the Eastern Counties.

Cutting sets into very small seed pieces is not advisable: such pieces have the same disadvantages as small, whole seed, with the additional hazards arising from cutting. There is every justification for cutting large seed tubers in half, thus giving two normal-sized seed pieces.

Where seed is cut, the "healing" of the cut surface must take place as quickly as possible. This is ensured by keeping the seed for 12–24 hours in a warm, damp atmosphere with ample oxygen. Planting immediately after cutting in an ideal tilth fulfils these conditions, but all too often in the field the soil is too cold or too dry for rapid healing. Bell, Gillson and Weston(3) recommended that the heap of cut tubers should be covered with damp sacks for 24 hours and exposure to cold or drying conditions avoided. Boxing cut sets is generally unsatisfactory and storage for more than a few days is risky. There is no advantage to be derived from the old practice of dusting the cut surfaces with substances such as lime or sulphur, but the use of certain organic fungicides is practised in America. This might be worth while under our conditions, but has not been investigated.

Certain varieties, notably King Edward and Majestic, are popularly believed to be unsuitable for cutting: experiments by Priestley and Woffenden(4) have confirmed that the formation of a cork layer to "heal" the cut is slower in these varieties, but there is ample evidence that seed of both varieties can be cut successfully if the cut sets are handled correctly.

More Extensive Use of Once-grown Seed At one time the Eastern Counties produced a considerable quantity of seed potatoes; some varieties, such as Royal Kidney, were grown very largely for the production of seed potatoes for export. This trade has now declined, but seed production is still important, since every year some 70,000 acres of maincrops in the province are planted with locally-grown seed. It has long been recognized that certain varieties are likely to give poor results if grown on for a second year, owing to their extreme susceptibility to virus diseases, and some farmers believe that once-grown seed should be obtained from a different soil type. Many early potato growers in the south-east prefer once home-grown seed for their earliest lifting, as it bulks earlier than imported seed.

During and immediately after the war some difficulty was experienced in obtaining sufficient seed of the desired quality from Scotland and Ireland; consequently the interest of many potato-growers turned to a wider use of

once-grown seed. A number of experiments were carried out between 1949 and 1951 by the N.A.A.S., in which once-grown Majestic potatoes were produced from the same Stock seed grown on five different soil types in the preceding year. These were then compared with a further lot of stock seed direct from Scotland. It was thus hoped to obtain information on the merits of once-grown seed from several parts of the province, and to investigate the traditional belief in the benefits of using seed from a different soil type. In all, fourteen experiments were carried out; five each in 1949 and 1950, and four in 1951. Each trial compared Stock seed with once-grown seed from each of the following soil types: boulder clay (Bedfordshire), Lower Greensand (Bedfordshire), black fen (Cambridgeshire), silt (Norfolk) and "Highland" light loam overlying Greensand (Norfolk). The results of the trials are not wholly consistent, but in general, the major importance of virus infection in determining yield was confirmed (Table 1). In all trials, high virus counts were followed by low yields, as might be expected from many previous experiments.

Table 1
Average Yields and Leaf Roll Counts from Trials on Majestic Potatoes in East Anglia, 1949–51

Stock	Total Yield	Ware (over 2-inch riddle)	Average Leaf Roll
	tons per acre		*per cent*
Scotch Stock seed	11.2	7.8	2.0
Once grown: Bedfordshire clay	11.3	7.6	3.3
Once grown: Norfolk highland	11.2	7.3	4.3
Once grown: Bedfordshire Greensand	10.2	6.8	9.2
Once grown: Norfolk silt	10.8	7.5	10.0
Once grown: Cambridgeshire black fen	8.8	5.5	39.1

The yields of the better once-grown stocks were remarkably close to those of Stock seed; on average, the once-grown stocks gave 93 per cent of the total yield and 89 per cent of the ware yield of the Scotch seed. If the Black Fen stocks are excluded, the difference between the yields of Scotch and once-grown seed in these trials amounted to 6 cwt. in total yield or 10 cwt. in yield of ware. There was no indication that change of seed within the province was of any value, except as a means of avoiding virus-infected stocks.

The local reputation of seed potatoes from the Black Fen has always been poor. It seems that it is extremely difficult in practice to avoid high virus infections in the Black Fen areas, but stocks capable of giving useful yields have been produced on all other soils. The factor of greatest importance in determining the yield potential of the stock in these experimental consignments appears to have been the degree of isolation which could be achieved from nearby virus-infected potato crops and from ground-keepers.

The commercial value of a seed sample is affected by factors other than the yield which it may produce. Among these are freedom from skin blemishes. It is often difficult to produce clean, scab-free samples of seed in the Eastern Counties and poor samples may not be commercially acceptable, owing to the belief that scab may be introduced to a clean farm. For planting on the farm where it was grown, such seed should not be rejected unless scab is so severe that the eyes are likely to have been affected. Satisfactory yields have been secured in these trials from scabbed seed which no potato-grower would normally buy for planting.

Producing Good Once-grown Seed Virus diseases cannot be cured, and, as the aphids which spread them in potatoes cannot yet be controlled, crops intended for seed production must be isolated from possible contamination. The parent stock should be of

S.S. or A health grade, and must be planted in a field free from groundkeepers, well away from other potato crops and from volunteer potatoes growing on old clamp sites. It should be unnecessary to add that any shortage of bought seed should not be remedied by planting a few bags of some local stock to "finish the field". Roguing, although valuable in recognized seed-growing areas, is often of little value in controlling virus diseases in East Anglia, where aphids become active so early in the season that virus has been spread through the crop from a few infected plants before the symptoms in those plants have become visible.

The best seed is produced from crops which have not been allowed to mature fully, the haulm being removed chemically or mechanically when the tubers reach seed size. In the Eastern Counties such methods are not generally considered economic for the production of maincrop seed, and in the trials referred to, the crops producing once-grown seed were allowed to mature normally. Satisfactory seed can be produced as a by-product of ware potato crops grown from a suitable parent stock in many areas. Farmers wishing to have an independent check on the health and purity of their potato crops can have them inspected under the Ministry of Agriculture scheme for the certification of growing crops*.

Future Prospects The best seed potato-growing areas owe their reputation to their relative freedom from those aphids which transmit virus diseases: this is largely a result of cool, moist and windy weather during the growing season. The south-east, with its hot summers and many host plants on which aphids can overwinter, inevitably has higher aphid populations than is desirable in a seed-growing district, and although, recent developments with systemic insecticides may make it possible to control aphids and restrict the spread of virus in a potato crop, it seems most unlikely that East Anglia will ever be self-sufficient in seed potatoes, even if such techniques become both technically possible and economically worth while. Nevertheless, any method of prolonging the life of the good seed stocks produced in recognized seed areas is of great potential importance.

Potato-growers in the United Kingdom plant between 1¼ and 1½ million tons of seed potatoes a year, and much of this seed has to be transported hundreds of miles in midwinter from the seed-growing areas. This costly and inconvenient traffic has become so much a tradition that many believe it to be indispensable. Successful seed production has been achieved in America in areas as liable to virus infection as the Eastern Counties, by vigorous certification schemes supplemented by "growing-on" tests in the winter months in the southern states. While no one would advocate that the ware growing areas of England should attempt to become self-sufficient in seed potato production, the application of modern knowledge may enable real economies to be made in producing a most valuable cash crop.

Acknowledgement is made to the N.A.A.S. officers responsible for the field work for the trials summarised in Table 1.

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* Details of this scheme can be obtained from the Ministry of Agriculture and Fisheries, Horticulture Branch 1, Whitehall Place, London, S.W.1, or from any County Agricultural Committee Office.

MANURING BRUSSELS SPROUTS

R. W. SHEPHERD. M.A.

Norfolk Agricultural Station, Sprowston, Norwich

Experimental work carried out at the Norfolk Agricultural Station on the manuring of Brussels sprouts suggests that satisfactory yields of good quality sprouts can be obtained by the correct use of dung and fertilizers, which are cheaper and easier to obtain than some of the organics often used.

TRIALS have been carried out for a number of years at the Norfolk Agricultural Station to determine the effect of various fertilizers and combinations of fertilizers on the yield and quality of Brussels sprouts. The results show that, provided the land is kept in good condition, satisfactory crops can be grown using ordinary fertilizers. Naturally, however, the soil and climate have a bearing on the optimum treatment. The annual rainfall at Sprowston is about 25 inches, and the soil is a light-medium loam overlying brick-earth, with an organic matter content of about 2 per cent. The P_2O_5 is classified medium to medium high, and the available potash low to very low. The trials were spread over three and, in some cases, four successive years. All the land received dung at the rate of 12 loads to the acre. The sprouts were planted out at the end of May and were picked in October or November, and again six to eight weeks later. At the second picking the yields of "blows" were recorded. The variety Rous Lench was used for nearly all this work.

From these trials it is apparent that nitrogen has the greatest effect on yield, but it can impair quality if used unwisely. The addition of 2 cwt. sulphate of ammonia to a mixture of superphosphate and potash increased the yield by 4 cwt. per acre, but, in the same trial, the addition of 4 cwt. sulphate of potash to a mixture of superphosphate and sulphate of ammonia increased the yield by only 2½ cwt. per acre; the addition of superphosphate to a nitrogen-potash mixture had no effect at all on yield. From the results of other trials at Sprowston, it would appear that the optimum level of nitrogenous manuring is between 3 and 4 cwt. sulphate of ammonia per acre, which increased the yield of saleable sprouts by about 10 cwt. per acre.

Table 1

Response to Various Combinations of Fertilizers
(cwt. per acre)

Treatment	Saleable Sprouts			Blows
	1st Pick	*2nd Pick*	*Total*	
Nil	36.7	25.1	61.8	8.4
N + P	44.5	23.9	68.4	11.5
N + K ..	45.0	25.4	70.4	11.4
N + P + K ..	44.5	26.4	70.9	11.6
P + K	41.8	25.3	67.1	10.5

N = 2 cwt. sulphate of ammonia
P = 4 cwt. superphosphate
K = 4 cwt. sulphate of potash

Trials were also carried out with soot—a traditional form of manuring for Brussels sprouts in some districts. One ton of soot (4 per cent nitrogen), which contains about the same amount of nitrogen as 4 cwt. sulphate of ammonia, increased the yield of saleable sprouts by 7½ cwt. per acre (Table 2), and it reduced their quality.

Table 2

Response to Nitrogenous Fertilizers
(cwt. per acre)

Treatment	Saleable Sprouts		Blows
	1st Pick	*2nd Pick*	
No nitrogen	45.5	25.5	9.6
2 cwt. sulphate of ammonia ..	52.0	23.1	10.2
4 cwt. sulphate of ammonia ..	55.5	25.5	11.9
1 ton soot	53.2	24.8	12.5

Timing and Response In some districts it is customary to give sprouts a top dressing of nitrogenous fertilizer some time after transplanting, but the results of further trials at Sprowston do not justify this practice (Table 3). In these trials all plots received ample phosphate and potash, and 3 cwt. sulphate of ammonia per acre. The nitrogen was either given all at transplanting, or half at transplanting and the remainder five, ten or fifteen weeks later. The response to nitrogen was very marked, and on the average of all treatments 3 cwt. sulphate of ammonia increased the yield of saleable sprouts by 16 cwt. per acre. Top dressing, however, did not increase the yield in any year; the plots top dressed five or ten weeks after transplanting gave the same yield as those receiving all the fertilizer at transplanting, and, when the dressing was delayed until fifteen weeks after transplanting, the yield was 5–6 cwt. per acre less.

Table 3

Response to Differing Times of Application of Nitrogen
(cwt. per acre)

Treatment	Saleable Sprouts		
	1st Pick	*2nd Pick*	*Total*
Control (no nitrogen)	23.4	36.1	59.5
3 cwt. S/A on seedbed	33.8	42.4	76.2
1½ cwt. S/A on seedbed and 1½ cwt. 5 weeks later	31.9	41.6	73.5
1½ cwt. S/A on seedbed and 1½ cwt. 10 weeks later	36.2	43.5	79.7
1½ cwt. S/A on seedbed and 1½ cwt. 15 weeks later	28.7	41.0	69.7

In all this work the use of inorganic fertilizers or soot had a marked effect on the quality of the sprouts. Increases in the yield of saleable sprouts were accompanied by increased amounts of blows, and the ratio of blows to saleable buttons was slightly affected, most of all by soot and very heavy dressings of sulphate of ammonia. In most years 3–4 cwt. per acre sulphate of ammonia improved the quality of the saleable buttons—making them firmer and darker in colour than those receiving no nitrogen. On the other hand, soot was inclined to increase the proportion of blows and make the buttons rather small and loose. Information on the effect of soot on the colour of the buttons is incomplete, but what we have does not suggest that soot is preferable in any way to sulphate of ammonia in this respect. Excessive nitrogen may also cause the crop to grow too luxuriantly and make it less resistant to frost.

Effect of Potash and Phosphates In two series of trials carried out on the use of potash, a dressing of 4 cwt. muriate of potash was found to increase the yield of saleable sprouts by 2½–3 cwt. per acre (Tables 1 and 4). However, these results were obtained on a soil very low in available potash. It is normally considered that sulphate of potash is better for sprouts than muriate of potash, but the results of our experiments do not confirm this belief. Both forms of fertilizer were applied

at the rate of 4 cwt. per acre and gave the same increase in yield. But in addition to increasing the yield of saleable sprouts, potassic fertilizers improved the quality and partly counteracted the detrimental effects of heavy dressings of nitrogen. In these trials all the plots receiving potash gave firmer and darker buttons than those receiving no potash.

Table 4

Response to Potash
(cwt. per acre)

Treatment	Saleable Sprouts			Blows
	1st Pick	*2nd Pick*	*Total*	
No potash	43.7	27.4	71.1	12.2
4 cwt. sulphate of potash	46.2	26.9	73.1	12.9
4 cwt. muriate of potash	47.0	27.0	74.0	12.2

The results of these trials suggest that at Sprowston phosphate is relatively unimportant in the manuring of this crop (Table 1). It had no effect on yield or quality, although there were some indications that it advanced the date of maturity. Phosphate might be of greater importance for crops grown on soil with a lower phosphate content than that at Sprowston, especially when no dung is applied.

Two-thirds of Response at First Picking Over some part of the period of the trials the first pickings were made at the end of October or early November, and about two-thirds of the total crop was taken then. In practically every instance the effects of potash and nitrogen treatments were most marked at the first picking; at the second picking all plots gave similar yields. There was, however, one consistent exception: the plants receiving phosphate and nitrogen but no potash yielded as heavily from the first picking as those receiving a complete fertilizer, but gave a much lower yield at the second picking (Table 1). It is probable that this fall-off in production was associated with the lack of potash. In other years, when harvest began early in October, a lower proportion of the final total yield was fit at the first picking, and the effect of the treatments persisted until the second picking. These years covered the work on top dressing, and on the average of all treatments approximately two-thirds of the response to the fertilizer was recorded at the first picking (Table 3).

Satisfactory Crops with Fertilizers To sum up, these trials show that provided the land is kept in good physical condition by the use of dung, satisfactory crops can be grown using the normal fertilizers. On the farm at Sprowston, nitrogenous fertilizers have the greatest effect upon yield, and the most suitable dressing of this fertilizer is about 4 cwt. per acre sulphate of ammonia, all of which can be applied before transplanting. The actual amount of nitrogenous fertilizer given to the crop must vary with the type and fertility of the soil. If too much nitrogen is given, the crop may suffer damage from frost and the quality of the buttons may suffer. If, therefore, the soil is in a state of high fertility, it is probably inadvisable to give more than 3 cwt. sulphate of ammonia per acre.

The possible ill-effects of heavy nitrogenous manuring can to some extent be counteracted by the use of potash fertilizers. On the Sprowston soils, which are very deficient in potash, 4 cwt. of muriate of potash gave an increase in yield of 2–3 cwt. of saleable sprouts per acre, and it appears to be immaterial from the point of either yield or quality whether the muriate or sulphate form is used. The response to phosphate was very poor at

Sprowston, but this is undoubtedly affected by the satisfactory phosphate status of soil, and it is likely that phosphate is more important for sprouts on other classes of land.

COLORADO BEETLE IN JERSEY

A STUDY OF THE PROBLEM OF SEABORNE INVASIONS

T. SMALL, O.B.E., D.Sc., and G. E. THOMAS, B.Sc.
States Experimental Station, Jersey

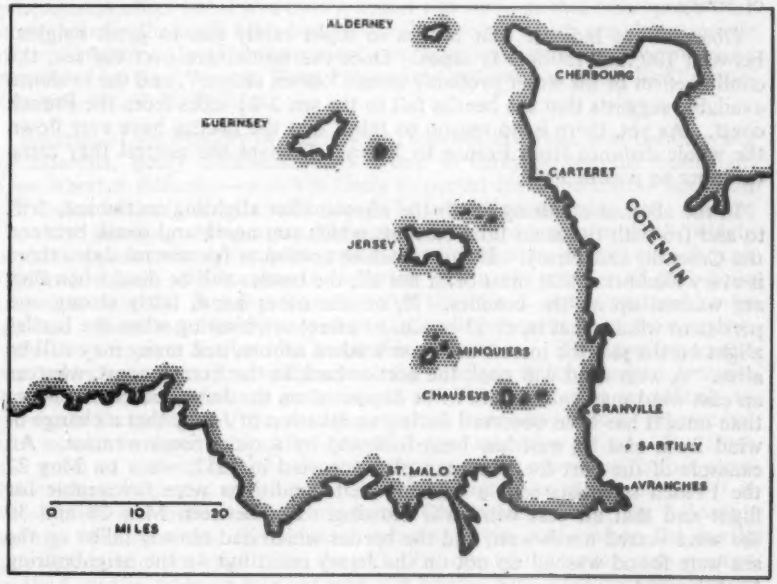
The following article appraises the present position and future outlook of the Colorado beetle in Jersey in the light of the past ten years experience of combating the pest—an experience which is perhaps unique in that in six years no less than eleven seaborne invasions have had to be dealt with.

DESPITE the many outbreaks that have occurred in Jersey since 1943 and, in particular, the eleven seaborne invasions that have taken place since 1947, the Colorado beetle has failed to establish itself, and so far as is known the Island is free from the pest at present. The wide experience gained during the past ten years and the success achieved give ground for hope that this favourable position can be maintained. In the past few years the main anxiety has been caused not by the relatively few beetles found inland, but by the constant menace of seaborne invasions.

When the invasions began in 1947, it seemed likely that the beetles were coming from somewhere in France, but to ascertain the actual area from which they came was not easy. Once liaison had been established with the French authorities, the first step was to examine the potato crops in the neighbouring coastal areas of France at the time of, or soon after, an invasion. Almost invariably it was found that relatively few beetles were present on the crops; yet in most of the invasions many thousands of beetles were washed up on the beaches, and in all probability still more were being carried out into the open sea. We were therefore perplexed to account for the very large numbers of beetles which must be leaving France at these times. No satisfactory explanation was forthcoming until it was realized that the reason so few beetles were present on the current year's potato crops when the invasions took place was that they were, at that early stage, still mainly confined to fields of cereals which had carried potato crops in the previous season. This information immediately suggested that an effective method for reducing the risk of invasion of the Channel Islands would be to spray the French potato crops just before mass hibernation occurred in late summer, and so decrease considerably the numbers of beetles going into hibernation in the autumn. This aspect of the problem is dealt with later.

In attempting to trace the source of the invading beetles, it is significant to note that so far as is known no seaborne invasion of the Channel Islands took place until 1947. Yet before the war the pest was abundant in the coastal areas around St. Malo and the Bay of Mont St. Michel. It seemed unlikely, therefore, that this area was the source of the invading beetles. The more likely suspect was the Cotentin, where, during the war and soon afterwards,

the pest became prevalent. Suspicion was increased by the fact that, apart perhaps from an area in the south near Pontorson and Avranches, this district had suffered no more than occasional isolated outbreaks before the war. It is now believed that the build-up of the beetle population in the Cotentin has in all probability led to the invasions of Jersey. Estimates by French scientists indicated that 50–100 million beetles were present in September 1950 in a coastal area of the Cotentin measuring 100 kilometres long (from the north of Carteret to the south of Carolles) by 10 kilometres deep, and that in one 2-acre crop in August 1950 there were no fewer than one million adult beetles. Furthermore, it became evident over a period of years that at the beginning of an invasion the beetles were found, with one or two exceptions, only on the east and north coasts of Jersey—that is, on the coasts nearest to the Cotentin. Thus the evidence available, although admittedly meagre, indicates that the Cotentin peninsula, and not Brittany, is the more likely source of the Channel Islands invasions.



Time and Probable Course of Invasions The eleven seaborne Colorado beetle invasions of Jersey have all taken place in the May–June period, and this fact is in itself significant, since it is reasonable to suppose that, since 1947, climatic conditions favourable to invasion have occurred at other times in the summer and autumn. It would appear, then, that there is some special reason why the beetle flights and movement occur more readily in the May–June period than later in the year. Many factors are probably responsible, and, of these, lack of food, as influenced by crop rotation, is thought to be important.

The time of the incursions clearly shows that all the invaders are beetles which have gone into hibernation in the soil during the previous autumn. This in turn means that the fields from which they come are those that have

carried potatoes in the year preceding the invasions; and these fields are usually sown to cereals after potatoes. Therefore, when the beetles emerge in May or June there is little, if anything, for them to feed upon, and movement in search of food is encouraged. Unfortunately, the climatic conditions prevailing at this time of maximum movement are often favourable to flight. The most suitable temperature for flight of the emerging beetles is between about 68° and 77° F.; below 68° F. and above 86° F., flight is rare. Once the beetle is in the air, the direction taken is usually, but not always, that of the prevailing wind. It so happens that in May and June easterly winds are frequent in the Cotentin–Jersey area. Meteorological records show that in May 35 per cent of the winds are from the north-east and 10 per cent from the south-east, whilst in June 30 per cent are from the north-east and 8 per cent from the south-east. Thus, when the beetles emerge in May to June, mass movement, encouraged by lack of food, frequently coincides with conditions favourable for flight. In addition, the movement occurs when east winds are prevalent and are likely to carry the beetles in the direction of Jersey.

Observations indicate that beetles in flight rarely rise to great heights: between 100 and 150 feet is usual. Once the beetles are over the sea, the cooling effect of the water probably causes "down shoots", and the evidence available suggests that the beetles fall to the sea 2–2½ miles from the French coast. As yet, there is no reason to think that the beetles have ever flown the whole distance from France to Jersey. Perhaps the nearest they came to doing so was in 1947.

In the absence of strong winds the insects, after alighting on the sea, drift to and fro with the main tidal currents which run north and south between the Cotentin and Jersey. If this situation continues for several days, there is every likelihood that most of, if not all, the beetles will be dead when they are washed up on the beaches. If, on the other hand, fairly strong and persistent winds (that is, of 13 m.p.h. or more) are blowing when the beetles alight on the sea, the insects are soon washed ashore, and many may still be alive. A west wind will wash the beetles back to the French coast, whereas an east wind may cause them to be deposited on the Jersey beaches. More than once it has been observed during an invasion of Jersey that a change of wind from east to west has been followed by a quick improvement. An example of the part the wind can play occurred in 1952, when on May 27 the French scientists sent a warning that conditions were favourable for flight and that an east wind was blowing. But between May 28 and 30 the wind veered north-west, and the beetles which had already fallen on the sea were found washed up not on the Jersey coast but on the neighbouring French coast.

It should not be assumed that all the live beetles washed up will survive; in one test in 1952 not one of 400 live beetles kept in the laboratory was alive after 24 hours. At other times the live beetles have remained most active, and copulation, egg-laying and short flights have been seen on the beaches.

Precautionary Spraying in France If the reasons given for the view that the recent build-up of the beetle population in the Cotentin has resulted in the invasion of the Channel Islands are valid, the only practical way to lessen the risk of invasion is to reduce the beetle population in this area, and this can be done only by spraying the crops with effective insecticides. To continue applying costly precautions in Jersey to obviate the consequences of invasions, and at the same time to make no

attempt to decrease the risks of invasion, would seem unsound. Furthermore, although the methods used in Jersey have been successful in controlling the pest up to now, the possibility of heavier and more frequent invasions in the future cannot be ruled out. Thus, when the setting up of a European Colorado Beetle Committee was first mooted in late 1947, with the aim of preventing the spread of the pest to new areas, the Channel Islands supported the scheme wholeheartedly. The serious and costly invasion of 1947 was still fresh in our minds; lifting the crops throughout Jersey had to be postponed for nine days at the height of the season and there was serious interference with labour, shipping etc.; in addition, the beetle established itself on the crops in no fewer than 45 breeding colonies. At this time no liaison existed between the French and Jersey authorities and there was no authentic information on the position in the Cotentin and of the steps being taken there to combat the pest.

In 1949 the European Colorado Beetle Committee carried out a preliminary spraying campaign with helicopters in the Caen area. This had a useful propaganda effect but it was costly, and it was obvious that helicopters were unsuitable for the small fields bounded by hedgerows which are characteristic of the Cotentin. In 1950 the present campaign was begun, and is now being continued by the European Plant Protection Organization under its Director-General, Dr. V. E. Wilkins.

Because of the number of farmers and officials involved, and the diversity of interests, many difficulties have arisen in carrying out the campaign. One inherent difficulty—which is likely to persist for some time— is that in the Cotentin the farmers' chief interests lie in grazing, dairying, etc. Except for three potato-growing areas, the potato crops are grown in small, widely separated plots, mainly for home and local consumption, so that even though Colorado beetle attacks may cause lower yields, the crop is of such little importance in the farming economy that the loss is not considered to be serious. Since most farmers stand to gain so little benefit from the spraying, they are therefore inclined to omit this precaution. This applies to the first spray application, but still more to the later one in July–August, because by this time a satisfactory potato yield has formed, and it is difficult to persuade the growers of the need for another later application. Moreover, this second treatment coincides with the busy harvesting period. But from the point of view of the Islands, the spraying of the crops just before mass hibernation begins is of great importance, because, as shown earlier, it is these hibernant beetles which invade the Channel Islands in the following spring. Furthermore, the summer spraying takes place when the beetle population is at its height. In August 1950 one of the writers was present in the Cotentin when an infested crop was treated with 5 per cent DDT dust. When spraying began there was an average of 7 beetles per plant, giving an estimated total of 140,000 beetles for the crop, but the following day the average was only 1.5 beetles per plant; that is, spraying had apparently destroyed 110,000 beetles. It would seem that at least two applications are necessary in most seasons.

Encouraging Results from the Cotentin Campaign

In 1949 and earlier, before the campaign began, the crops throughout the north of the Cotentin were heavily infested by the Colorado beetle. For example, in the two extensive potato areas of Tourlaville–Maupertuis and Barfleur–Reville, millions of beetles were present on the crops, and large numbers were also to be found in the streets of Cherbourg, on the roads and hedgerows, and even on the offshore forts near Cherbourg. Because of

this and the close proximity of the area to the Channel Islands, the main effort in the first year (1950) was made in the northern half of the peninsula. The scheme was not fully operative in 1950, and widespread potato blight interfered with the spraying programme. Nevertheless, after two seasons' work it was evident that excellent progress had been made, and an inspection of the two potato areas mentioned above by one of the writers in late June 1952 showed that they were relatively free from the pest. The far lighter infestation in the north of the Cotentin, as compared with the south, could have been caused by several factors, including (a) the greater winter mortality, (b) later emergence of the hibernants in spring, and (c) spraying. Observations by French scientists indicated, however, that the reduced infestation was due chiefly to spraying, and this conclusion was supported by the fact that the few unsprayed fields in the north were heavily infested in June 1952.

From the point of view of the Channel Islands, a significant fact emerges from these results. When the campaign began there was some doubt as to whether, having reduced the beetle population in a particular coastal zone, further invasions of that zone from the interior of the country would take place and nullify the effects of spraying. But it was soon evident that this did not happen. Accordingly, it was decided to extend the 1951 campaign to a point as far south as Sartilly and St. Jean le Thomas; to go beyond this point would greatly increase the cost, owing to the large acreage of potatoes grown. Far more spraying is now being done in this area than previously, but it is too early to assess the results. If, however, the beetle population can be reduced in the south, as has already been done in the north, then the danger of seaborne invasions of Jersey should be considerably lessened.

The Future In considering the future outlook, there is little doubt that the campaign has reduced the beetle population in the Cotentin. But whether the reduction will ever be sufficient to eliminate the chances of seaborne invasions is another matter. It is perhaps relevant to recall that 1946 was very unfavourable for the multiplication of the pest, yet in 1947 a most serious seaborne invasion took place. This suggests that a large decrease in the beetle population is required to remove the menace to the Islands. The extremely light incursion of 1953 was probably due more to unfavourable weather conditions than to the effects of spraying.

The writers take the view that it is too early to draw definite conclusions as to the value of the campaign in France. But, so far, the Channel Islands are holding their own in the struggle to prevent the beetle from establishing itself permanently in the Islands. Furthermore, as a result of the information obtained from France, together with local experience and observations, the Jersey authorities are better able to assess the risks and, in this way, to reduce the cost of the precautions taken in the Island. The view might be taken that in the absence of such a scheme the recent invasions would have been heavier and more frequent—a view which can neither be substantiated nor refuted. Now that the scheme is fully operative, the crucial test will come when the climatic conditions are very favourable for beetle reproduction, flight and invasion. Meanwhile it would be advisable to continue the Cotentin scheme in view of the high value of the potato and tomato exports from Jersey. If the scheme were abandoned now, it is likely that a dangerous build-up of the beetle population would soon take place.

Earlier articles on the campaign against Colorado beetle in Jersey were published in the following issues of this JOURNAL: January 1947, March 1948, June 1949, March 1951.

BROILERS

A YORKS NORTH RIDING EXPERIMENT

J. S. RICHARDS, N.D.P.

National Agricultural Advisory Service, Yorks and Lancs Province

The results of an experiment conducted on commercial lines in the North Riding of Yorkshire show that feeding a growth stimulant and caponizing the birds both tend to increase profits from broiler production, and that the most economical age at which to dispose of the birds is twelve weeks.

TABLE poultry has become an important talking point with many farmers throughout the country. New management techniques have been developed, based on ideas from America, to save labour and allow large numbers of birds to be reared in a limited space. Feedingstuffs are free from control, so special rations can again be made up to give better conversion rates. These factors, together with a great deal of publicity on the subject, have led to many requests for advice on the production of the 3–4 lb. chicken, or the "broiler," as it is commonly known.

In producing table poultry, a farmer is looking for profit. This, in reality, means good weights with low food consumption and low costs, and so he is searching for the answers to questions such as: How much food does it take to produce a 4 lb. bird? Are the growth stimulants which we hear so much about really effective? Does it pay to caponize birds which are to be sold at an early age? What is the most profitable age at which to sell? Our experiment was designed to ascertain the effects of the following:

1. A ration containing a combination of a growth stimulant—namely, the derivative of phenylarsonic acid and an antibiotic—as compared with a control ration.
2. Chemical caponization in broiler production when a normal ration is fed.
3. Chemical caponization when the ration is supplemented as in (1).

In addition, we sought to keep a check on the food consumed to various ages and to find out the most profitable age for selling the birds.

Layout of the Experiment It was realized from the beginning of the experiment that if the facts to be gleaned were to serve any useful purpose, large numbers of birds would have to be reared and kept under commercial conditions. In fact, they would have to be produced on broiler lines. Accordingly, an insulated Nissen hut, measuring 108 feet by 30 feet, was used, and divided into twelve pens, each measuring 13 feet by 18 feet. These pens housed four different groups:

200 chicks fed on a control ration.
200 chicks fed on a control ration and supplements.
200 chicks fed on a control ration and caponized at 7 weeks old.
200 chicks fed on a control ration plus supplements and also caponized at 7 weeks old.

Each group was replicated three times, giving 600 chicks to a group and making a grand total of 2,400 birds in the experiment.

The experiment started on September 9, 1953, and the last birds were sold on December 14. The breed used was Rhode Island Red × Light Sussex, and the chicks were reared under infra-red lamps, sawdust being used for litter. Water and dry mash were available to the birds all day, different mashes being used for (a) the first six weeks, and (b) from six weeks onwards. The mixtures for the control pen were as follows:

First Six Weeks	cwt.	st.
Maize meal	2	5
Wheat meal	2	–
Barley meal	1	4
Oatmeal		4
Sharps		4
Fishmeal	1	–
Meatmeal		2
Groundnut meal		5
Soya bean meal		5
Dried skim milk		2
Minerals		1
Vitamin supplement	1½ lb.	

Six Weeks Onwards	cwt.	st.
Maize meal	2	4
Wheat meal	3	–
Barley meal	1	5
Oats		4
Sharps		4
Fishmeal		6
Meatmeal		2
Groundnut meal		2
Soya bean meal		2
Dried skim milk		2
Minerals		1
Vitamin supplement	1½ lb.	

For the supplemented ration, the antibiotic and a derivative from phenylarsonic acid were added. Both mixtures contained nitrofurazone, as a preventative against coccidiosis. The mortality over the whole test was 6½ per cent, and although some of the losses were due to coccidiosis, this disease, which is one of the greatest scourges of table poultry, was kept well under control, doubtless as a result of the drug being fed at preventative levels.

Significant Differences at Fourteen Weeks In an experiment of this kind there is a tendency to become so involved in statistical data that the results are difficult to follow, and so an attempt has been made here to simplify the findings as much as possible. Tables 1 and 2 show respectively the weights and conversion rates of the various groups towards the end of the experiment and the combined effect of these two factors on the cash returns of the birds sold.

Table 1
Average Weight and Conversion Rates

Group	Weight		Conversion Rate	
	12th Week	14th Week	12th Week	14th Week
	lb.	lb.	lb.	lb.
Control	3.81	4.46	3.67	4.11
Caponized	3.95	4.7	3.65	3.86
Supplemented	3.94	4.66	3.62	3.86
Supplemented and caponized	3.95	4.48	3.71	4.05

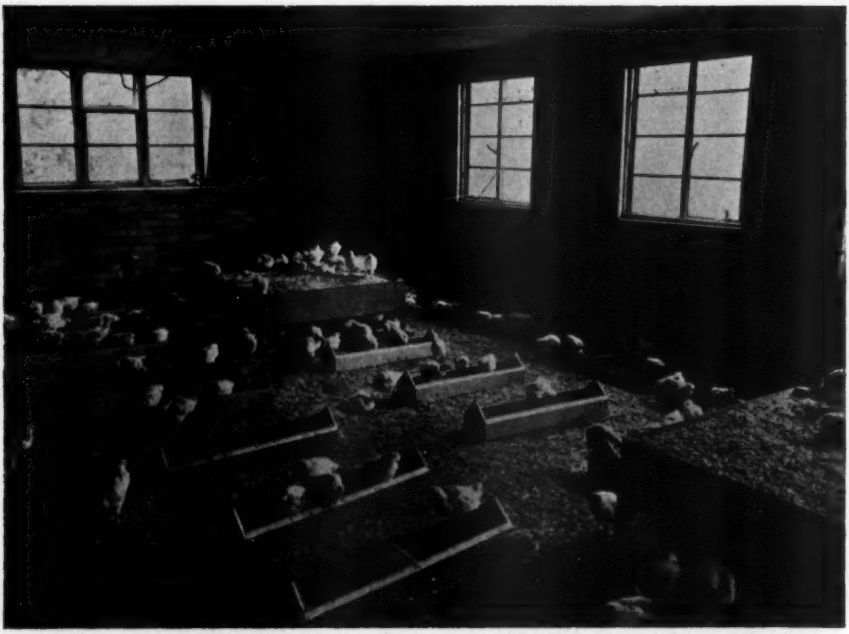
From the above table it will be seen that the differences between the various groups up to the 12-week stage are very small in both weight and food consumed per lb. live weight gained. The differences at the 14-week stage are, however, more significant, in that the caponized pens and the group receiving the supplement show slightly better weights and conversion rates than the control.

These findings are rather striking, because one might expect the growth stimulants and chemical caponizing, of which we hear and read so much, to give a more marked improvement at all stages.

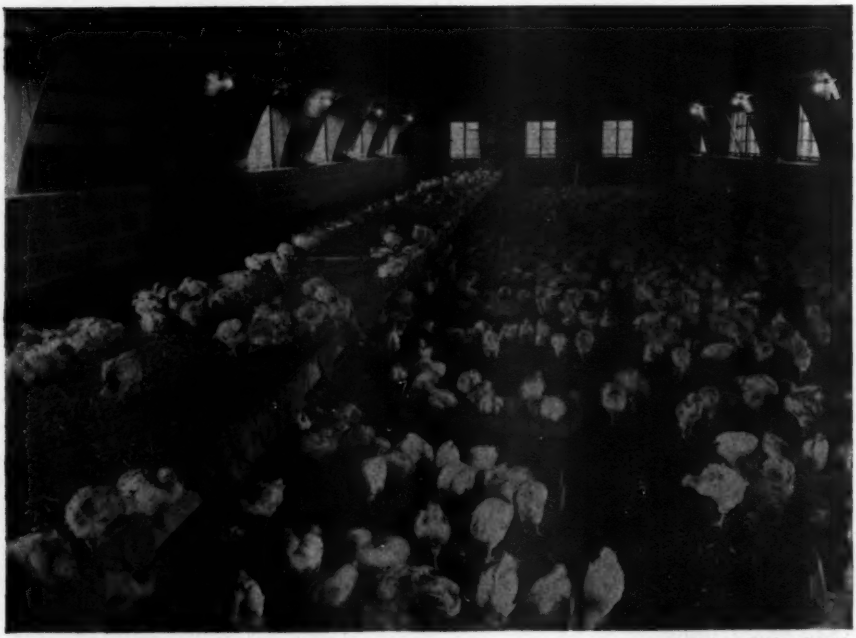
Although the above figures are important in themselves, of more interest is their effect on cash returns, and this is illustrated in Table 2. Here the true value of caponization and growth stimulants is revealed. The amounts shown are those left when food costs have been deducted from the proceeds of the sale of the birds. The figures are based on a price of 2s. 9d. per lb. received at 12 weeks old, and 2s. 10d. per lb. at 14 weeks. The price paid for food worked out at 4½d. per lb.

Photo : *Farmer and Stock-Breeder*

The best age for selling broilers would seem to be 12 weeks.



A corner of a modern, insulated broiler house. The birds are about 7–8 weeks old.



Photos : *Poultry World*

An insulated Nissen hut of the size used in the experiment. A hot-water brooder runs down on the left.

A well-stocked nursery supplies most of the Estate's needs.

The importance of good farm buildings is well demonstrated at Orslow Manor Farm, Blymhill.

Farmhouse at Knoll Farm, Tong

Thirty-six new cottages have been erected since the war.

Table 2

Average Margin over Food Costs

Group	12th Week	14th Week
	s. d.	*s. d.*
Control	5 2½	5 11½
Caponized	5 5½	6 8½
Supplemented	5 5½	6 7½
Supplemented and caponized	5 4½	6 0½

It will be seen that the increased value from caponizing the birds amounted to 3d. per bird at 12 weeks and 9d. at 14 weeks, while the birds which received the supplement followed on very similar lines, in that they increased in value by 3d. at 12 weeks and 8d. at 14 weeks. However, the surprising thing about the results is that the chickens receiving the supplement and which were also caponized showed no real advantage over the control birds. But although it would seem from this experiment that the advantages to be gained by using the growth supplements or by caponizing birds are very similar, in practice, adding a growth supplement to the food is easier than caponizing the stock, for with the large number of birds which are likely to be involved in broiler production the labour and disturbance caused in catching the birds to treat them creates many problems.

The Age to Sell The question which often arises with table poultry is the most profitable age and weight at which the birds should be sold. An attempt was made to arrive at this information by selling a group of 300 birds at the tenth week, 600 birds at both the eleventh and twelfth weeks, and the remaining birds, amounting to 670, at the fourteenth week. The first group were sold on November 18, and the prices ruling for that period for the different weight ranges were used right through the experiment, so that fair comparisons could be made for each age group sold. Table 3 shows the value of the birds during the last four weeks and the variation in the margin over food costs at each stage.

Table 3

Changes in Margin over Last 4 Weeks

Week	Income per Bird	Food Costs	Margin over Food Costs	Gain per Week
	s. d.	*s. d.*	*s. d.*	*d.*
10th	7 5	3 9½	3 8½	–
11th	9 0	4 6	4 6	9½
12th	10 9	5 3½	5 5½	11½
13th	12 4	6 2	6 1	7½
14th	13 3½	7 0	6 3½	2½

If we examine the last column, it shows that the biggest increase was at the twelfth week, at which point the birds had gained 11½d., compared with the previous week. In fact, between the tenth and twelfth weeks the total gain amounted to 1s. 6d. per bird, whereas between the twelfth and fourteenth the gain was only 10d. The reason for this seemed to be that after the birds reached 4½ lb. the rate of liveweight gain slowed up considerably, although the consumption of food still increased with age. These two factors mean that the conversion rate deteriorates considerably, making the production of table poultry expensive above this weight. This point needs great emphasis, as it is customary for farmers to keep their birds much longer than we did. Granted, they get heavier birds, but the extra weight put on at these later stages is extremely expensive to produce.

Advantages of Caponization and Growth Supplements The following facts seem to emerge from the experiment: (1) that by feeding the particular supplement used, the consumption of feed is slightly less at all stages, and, compared with birds fed on ordinary rations, there is a slight improvement in weight from 12 weeks onwards. (The combined effect of these factors made a difference of 3d. per bird at 12 weeks and 8d. at 14 weeks); (2) caponized birds develop on similar lines, but where the stock were both caponized and fed the supplement, the results were no better than for the control group.

From the prices received and the weights attained, the best age for selling the birds in "broiler" production would seem to be at 12 weeks, for if the birds are kept longer there is a marked drop in the weekly increase in their value.

Thanks are due to the Reeden Poultry Company, who willingly co-operated in the experiment and put at our disposal the necessary stock, equipment, food and housing.

AGRICULTURAL INDEX NUMBERS AND PRICES

MONTHLY INDEX NUMBERS AND PRICES OF AGRICULTURAL PRODUCTS

INCLUDING EXCHEQUER PAYMENTS (UNCORRECTED FOR SEASONAL VARIATION)
BASE 1927-29 = 100

	Unit Index	Prices used for March 1954 Index	1954			1953		
			Jan.	Feb.	Mar.	Jan.	Feb.	Mar.
All Products ..	—	—	306*	296*	289*	312	303	288
Cereals and Farm Crops ..	—	—	264	267	274	263	270	277
Livestock and L'stock Products	—	—	318*	304*	293*	326	313	291
		s. d.						
Wheat	cwt.	33 0	310	313	319	298	300	306
Barley	,,	27 0	261	252	245	280	287	283
Oats	,,	23 2	250	250	250	284	288	284
Potatoes ..	ton	266 6	240	250	265	235	245	260
Hay	—	—	190	194	196	205	208	205
Fat cattle ..	live cwt.	143 8	275	283	292	260	272	281
Fat cows ..	,,	73 4	194	201	209	194	206	209
Fat sheep ..	lb. d.w.	2 11	251	265	275	245	259	269
Fat ewes ..	,,	1 10¼	233	248	273	224	242	267
Bacon pigs ..	score	54 0*	362*	357*	354*	362	363	364
Pork pigs ..	(20 lb.)	56 6	340	335	334	299	299	299
Sows	d.w.	24 5	221	214	212	238	238	238
Milk	gallon	3 7.1*	374*	355*	332*	369	348	319
Butter	12 lb.	44 0	190	196	210	171	171	171
Poultry	—	—	251	244	246	266	264	248
Eggs	120	35 0*	239	207	193*	317	283	230
		£ *s. d.*						
Store Stock†								
Dairy cows ..	head	57 13 0	227	220	213	217	214	206
Store cattle ..	,,	43 2 0	284	288	296	257	268	280
Store sheep ..	,,	7 15 6	269	282	287	256	272	278
Store pigs ..	,,	8 2 4	476	478	477	475	481	483

* Provisional † Not included in general index

GOOD ESTATE MANAGEMENT

THE BRADFORD ESTATE

A. J. LANGDON, M.A., F.L.A.S., F.R.I.C.S.

Viscount Newport's 15,000 acre estate on the borders of Shropshire and Staffordshire provides an interesting example of present-day enlightened land ownership.

RECENT investigations have shown that the larger, traditional type of landed estate of 1,000 acres and over has declined more in size and number during the last seventy to eighty years than any other type of estate, and many would claim that this decline is principally due to the effect of death duties. On the other hand, the owners of the larger estates between them still hold more of the land of the country than any other type of landowner. It is interesting, therefore, to know something of the management of an estate of this type, especially when, like the Bradford Estate, it has shown no signs of following the general tendency to decline in size. Such an estate also contains many examples of what can be done under today's conditions by a public-spirited landowner aided by a knowledgeable land agent in complying with the well-known dictum of John Stuart Mill that "the reasons which form the justification of private property in land are valid in so far as the proprietor of the land is its improver".

The Bradford Estate, which extends to about 15,000 acres, belongs to VISCOUNT NEWPORT as tenant for life, having been transferred to him after the last war by his father, the present Earl of Bradford, who has, however, retained possession of the mansion house, park and home farm. While Lord Newport owns other property, both urban and agricultural, the Bradford Estate is the principal unit. It came into his family by marriage in the middle of the seventeenth century and, except for minor sales and purchases, has altered very little in size until recent years, when it was increased by the purchase of the 3,500-acre Wood Eaton Estate, lying on the northern boundary.

The Estate is situated on the Staffordshire–Shropshire border and is reasonably compact, extending from Gnosall in the north to Cosford in the south, some nine miles apart ; Watling Street intersects the southern part. The land varies from a blow-away sand derived from the Bunter sands to the stiff soils of the Keuper Marl : the Land Utilisation Survey grades most of it no higher than Class 4. The farms number about 100, with about half over 100 acres, running up to 600 acres, and about 40 smallholdings of 50 acres and less. It has always been an area of mixed farming with arable crops well to the fore and the livestock principally kept for feeding. Between the wars the area of grass increased, and the dairy cow, the stand-by on so many farms in times of depression, increased in numbers, until now almost every farm has a milking herd. Most of the buildings were erected nearly a century ago and are substantially constructed of brick and tile, often arranged around open yards with boxes, stables and wagon sheds suited to a type of farming and equipment long outmoded. Farmhouses and cottages, too, were substantially built, but many of the cottages were small and cramped by modern standards. Fortunately perhaps for conditions today, the Estate contains no large villages but only a few scattered hamlets, so that almost all the cottages and houses are let with the farms and there is little unremunerative residential property.

Maintenance and Reconditioning Since the war there have been three main problems to be faced so far as the fixed equipment is concerned ; to overtake the arrears of maintenance accumulating during the war, to recondition the many buildings showing signs of reaching the end of their useful lives, and to provide the new equipment required for modern farming methods. Here the family motto *Nec temere nec timide* (Neither rashly nor timidly) has proved useful, since a careful and systematic approach to these problems is obviously essential if a programme of this size is to be completed within a reasonable time and the owner is to receive a return on his expenditure. It is a matter of congratulation that the arrears of maintenance have now been put right and a great deal of reconditioning completed. One of the principal aims has been to reduce future maintenance by the use of materials needing no regular attention ; for example, cast aluminium rainwater gutters, which do not need the painting required for cast iron, and plastic sanitary fittings, which do not corrode. Many of the old tiled roofs are wearing out, and their replacement has presented a problem ; asbestos cement sheeting has been used extensively on farm buildings, but with its relatively short life compared with the century-old tiling it hardly seems a complete substitute and it is not much liked for dwelling-house roofs, recently, cedar shingles with their improved appearance and durability have been used.

Improvements have been numerous : during and since the war a piped water supply was laid on to many farms, and now almost all have a satisfactory supply. Here again, durability is regarded as important and plastic "alkathene" tubing has been widely used. Much the same progress has been made with field drainage and electricity, and nearly every farm on the original property now has electricity. In the buildings themselves the aim has been to see that every farm in need has an adequate Dutch barn and a cowhouse that comes up to the requirements of the Milk and Dairies Regulations. This part of the programme has almost been completed. Where increased dairy accommodation is needed, it is hoped that in future greater use will be made of the yard-and-parlour system, for which the old feeding buildings seem well suited; but so far it is an untried system in the area.

Good Housing Housing, in particular, ranks high on the list of improvements, and the thirty-six new cottages erected since the war for farm and estate workers are no mean achievement. The cottages themselves provide an outstanding example of good design with adequate accommodation at a very reasonable cost, complying well with the words of W. Pitt in his *Survey of the Agriculture of Staffordshire*, published in 1796: "In the construction of farm offices, economy ought doubtless to be kept in view, and the money so laid out as to pay an interest to the proprietor ; which will always be the case in real conveniences, for which the occupier had better pay interest than go without them".

Having made good deficiencies in numbers, the Estate is now turning to a programme of modernizing existing cottages and houses, for which it is hoped that grants under the Housing Act, 1949, will be more readily available in future. Most of the repairs and much new work is carried out by the estate staff to save cost by eliminating a contractor's profits and overheads. By employing the estate men wherever possible on a piecework basis, and contracting out work to them in gangs, some of the difficulty of supervising the scattered staff working on many small jobs has been overcome, as well as providing the men with a useful incentive.

The Estate too has always provided good housing for its workers and was one of the first subscribers to the C.L.A.'s recent scheme for providing pensions for farm and estate workers. By such methods as these it has been possible to get and keep a good type of tradesmen, in spite of the attractions of high wages to be obtained in the nearby industrial areas of the Black Country. The Estate is also fortunate in having two well-equipped yards, which have helped organization of building work and reduced transport costs.

Estate Finance The financing of a large programme of building work has, of course, presented many problems. With land not of the best, rents have always tended to be low in spite of the high standard of the landlord's equipment, and at the end of the war the level of rents was well below the average for the county. They were then revised in 1949, after a careful farm-to-farm survey by the Agent, Mr. S. Egar, and discussion with each tenant, to bring them to a more reasonable level. The average increase was about 30 per cent, but even this only brought rents up to the then county level. A further revision has recently taken place on the advice of a well-known agricultural valuer, very wisely called in to give an independent view and to avoid possible friction between landlord and tenant. The result, a further increase of 15–20 per cent, will still leave the rents well below the level which can be obtained on new lettings. A realistic view has also been taken of rent increases following improvements : these are calculated to give the landlord a reasonable return on his investment, together with an allowance to cover maintenance and ultimate replacement. The resulting figure, depending, of course, on the type of building, has meant a return of 7–8 per cent on capital cost. Since no private landlord's purse is bottomless, arrangements have been made in many cases for sharing the capital cost of improvements, with the tenant forgoing any claim for compensation at the end of his tenancy and the landlord forgoing any increase in rent. A lot of thought has been given to graduating such arrangements to the tenant's capacity to find his share of the capital cost, and one solution found successful with progressive tenants has been for the Estate to supply the plans and materials for the new building, while the tenant provides the labour. It is, in fact, one of the advantages of our landlord-and-tenant system and the close partnership which can result, that such arrangements can be made to the mutual benefit of both parties.

An excellent business approach to estate finances has also been adopted in other directions. Full use is made of all Government grants and subsidies available for fixed equipment, and the tenants too have been encouraged to take advantage of all grants on the husbandry side. Similarly, full use has been made of any income tax concessions, such as maintenance and capital expenditure claims.

Lord Newport has also some experience of his tenants' farming problems, since he has taken in hand during the last few years a 400-acre farm on the Estate, typical of the farms of the district. As President of the Soil Association, his farming methods place more importance on the making of humus than some would feel justified. On the other hand, farming progress owes much in the past to landowners who, with the courage of their convictions, have been the pioneers of new farming methods which have later become established practice.

Forestry The Estate is well wooded, and forestry has always been a prominent feature : two Silver Medals at the Royal Show at Shrewsbury in 1949 for new plantations and for the nursery are some evidence of success.

Some 1,200 acres have been put under the Forestry Commission's Dedication Scheme, and replanting has proceeded rapidly since the war—about 600 acres in seven years—though it is proposed in future to reduce this rate of planting, as arrears have now been made up. A considerable amount of timber was felled during the war, except in the Park, where tree cover was required for aeroplanes, and in addition to many areas of good quality oak and conifers, the few existing stands of immature conifers went for pit-props. Felling has continued since the war in the areas of low stocking or poorer quality, such as old coppice, and the proceeds have helped the estate finances considerably, as well as providing useful timber for estate use. Assessment of the old woods under Schedule B and the new plantations under Schedule D has minimized the effects of taxation. The forestry department is well equipped with its own electrically powered saw-mill, diesel tractors and mobile saws, and there is a well-stocked nursery supplying most estate needs. As with the other estate men, the foresters work wherever possible in gangs on piecework.

Sporting rights, too, have been put to the best advantage. The shooting, which is of a high standard, due to the rigorous extermination of vermin, is partly kept in hand and partly let off. Some of the fishing in the various lakes or meres is let off to clubs from the industrial area, and some on day tickets.

In a short article it is, of course, impossible to go into the many details which make up the successful management of a large estate, but it is hoped that sufficient has been said to make clear how a progressive landlord is interpreting his responsibilities of ownership.

THE CATTLE OF BRITAIN

5. DEVON

ARRIVING by air to visit a farm in the west of England, a distinguished nobleman, with a wide experience of agriculture, remarked that he had seldom seen a more pleasing sight than that of the herd of Devon cattle which he saw as he came in to land. The same sentiment has been expressed on many occasions by holidaymakers, both in the West Country and, now that the breed is more widely distributed, in other areas as well. The green pastures of Devon make a perfect background for the dark cherry-red coats of these compact, hardy producers of succulent beef, and together they make a most attractive "animal-vegetable" contribution to the beauty of the landscape.

It is, of course, not only beauty which has won the Devon its good reputation: qualities such as early maturity, the ability to fatten on natural grasses, satisfactory weight-for-age percentages, the flavour of its beef, freedom from disease, docility, and foraging ability, have been mainly responsible for keeping it among the leading British beef breeds. Indeed, although it is probably the least publicized of breeds, the Devon has held its own throughout the years, and today shows definite signs of further advancement.

Little is known of the exact origin of the breed. Charles Kingsley introduced them into a scene in his famous novel *Westward Ho!*, and there is a record of some red cattle being taken from Cornwall to Kerry in 1580.

Colonel J. Tanner Davy, of Rose Ash, near South Molton, Devon, who founded "Davy's Devon Herd Book"—the official record of the breed—stated in 1851 that his family had been breeding choice Devons for one hundred and fifty years, while members of another pioneer breeding family, the Quartlys, are known to have had a herd of "Red Rubies" at Molland, North Devon, in 1703. Present-day catalogues include animals which trace their ancestry to early "Davy" and "Quartly" strains.

In the days when tractors and other farm machinery were not thought of, Devons proved their worth as yoke oxen, and were described by contemporary writers as the best of all animals for draught purposes. Exhibitors of Devons at the famous Smithfield Show in those days had no long-distance lorries to transport their cattle from the South-West to London, and the potential prizewinners had to cover the long distance on foot—a feat which they literally took in their stride!

In the past, the Devons were largely confined to the four south-western counties, but now many pedigree herds have sprung up in the Midlands, southern and Home Counties, and the breed has penetrated as far north as Yorkshire, Cumberland and Scotland. Important show successes have been obtained by the owners of these comparatively new herds, which compete in friendly rivalry with the older-established West Country herds for the honours of the showyard and the export trade.

The more spectacular showyard successes have passed the breed by in recent years, and its record is rather one of quiet consistency. But on many occasions at Smithfield it has demonstrated its claim to be the best early-maturing breed by producing the heaviest animal exhibited in the baby beef classes, and at recent Birmingham Fatstock Shows Devons have won both the 100 guineas Silver Challenge Cup for the best beast not exceeding 11 cwt. in the butchers' classes—beating animals of all the leading horned and polled breeds—and the Webb 50 guineas Silver Challenge Cup for the best animal of all breeds bred by the exhibitor.

"Red Rubies" have been exported to many parts of the world. In Australia and Brazil, in particular, they have stood up to the difficult weather conditions and have survived droughts which have proved too much for some other breeds. Chiefly through the importation of good sires from England, the Devon breed reached a really good standard in Australia, and some excellent specimens are to be seen both in the showyard and out in the bush. At the 1952 Sydney Royal Agricultural Show the breed scored a great triumph when a Devon steer won the carcass championship against animals of all breeds. The weight of this fine steer—1,369 lb. at 19 months—was the highest in the competition.

In Brazil, a high standard has been attained. Bulls from the United Kingdom are left to run with the cows on the range and stabled only for short periods, although the climate is subject to considerable seasonal variations of heat and cold. Under such conditions, the Devons do remarkably well. Devons are also flourishing in South and South-West Africa, the U.S.A. and Jamaica, while fresh ground has recently been broken by the export of animals to New Zealand and Portugal.

Although noted mainly as beef producers, the milking qualities of the Devons have not been forgotten. Milk-recorded herds are few, but the records show the butterfat percentage to be usually around 4 per cent, and the richness of "Devon" cream is almost legendary. Farmers whose object is to breed for beef only generally find that their Devon cows are good milkers and bring up their calves well.

Since the beginning of the war Devons have consistently come out well at the Ministry of Food grading centres, qualifying in large numbers for the "Special" and "A" grades. Butchers are keen to have them because they provide small joints nicely marbled with a reasonable amount of fat. The policy of the Society has remained unchanged by recent happenings. The Devon will go on providing the meat which the housewife wants and which she will shortly be able to insist upon. The demand for "Red Rubies" is ever-increasing and, with the public once more in a position to ask for the best, the Devon is bound to flourish.

As with most other horned breeds of cattle, the possibility of eliminating horns to suit the needs of those who prefer their cattle polled has been given consideration, and experiments in this connection are in hand. But this is a subject for the future.

C. E. Berry,
Secretary,
Devon Cattle Breeders' Society

6. DEXTER

DEXTER cattle were originally bred by smallholders in the south and south-west of Ireland, and were first brought into England in 1882. They were shown at the Royal Show at Norwich in 1886, and the English Dexter Herd Book was founded in 1900.

The Dexter is the smallest British breed, the cow weighing on average 650 lb. Their smallness is accentuated by the shortness of their legs between knee and fetlock. Some strains have rather longer legs than others, without showing any increase in overall weight. In the past, such beasts, while excellent in every respect, were not often seen in the show-ring, but it is interesting to record that one of the winners at the 1953 Dairy Show was what is generally spoken of as a "leggy" type.

Being originally a mountain breed, the Dexter is extremely hardy, free from common diseases, and can with advantage be kept outdoors all the year round, even in the severest weather encountered in this country. They are particularly valuable on land likely to poach with heavier cattle, since, due to their light weight, they can negotiate the worst gateways throughout the winter without trouble. Omnivorous in their grazing they are capable of thriving on the closest grazed pasture, where normally only sheep could make a living. They will continually pick over coarse roughage, tackling such weeds as thistles and nettles and reducing the whole to an evenly cropped pasture.

In spite of their small size, they are excellent milkers. A normal Dexter will give 500–600 gallons a year, though cows yielding more than double this amount are known. At the 1948 Royal Show a seven-year-old cow gave 42.4 lb. milk, averaging 4.61 per cent butter fat, in twenty-four hours.

Dexters are essentially a dual-purpose breed, and steers require little more than rough grazing to bring them to profitable maturity of 6½ cwt. between their second and third years. With the meat shortage in this country, there is every inducement to rear the bull calves. In the past, some of the best quality beef carcasses at the Smithfield and Birmingham Fatstock Shows have been those resulting from a Dexter on one side and a Shorthorn or Aberdeen-Angus on the other. Little difficulty is experienced in keeping

Dexters in calf regularly, one contributory factor being the ease with which bulls can run with herds. Cows produce their first calves at the age of two and commonly have about eight calves during their lifetime, though ten or more are not unusual, because of the low wastage rate through disease.

The animals are particularly placid and make excellent house cows. With their economical feeding habits, they have always been popular with smallholders, and herds can be seen in most counties. Today, with the increasing shortage and high cost of animal feedingstuffs, Dexters are making a much wider appeal to farmers, particularly those with a moderate acreage, and many who have had the initiative to change to this breed have been surprised at the favourable results achieved. The basic reason for their popularity is that a 650 lb. Dexter needs only three-fifths of the food required by the average 1,200 lb. dairy cow, which means that ten Dexters can be carried on the same area as six animals of a larger breed. Since the Dexter yields 500–600 gallons a year (and many give half as much again), it follows that a Dexter cow has a much higher milking efficiency than the ordinary dairy cow, which, in this country, averages only 600 gallons, and rarely yields more than 800 gallons.

The ability to run more cows on a given acreage also leads to a greater number of calvings, which, by judicious management, makes for a more level milk supply. Moreover, should a casualty occur in a herd, neither the loss in milk supply nor the capital value is so great as in a normal dairy herd. For small farms, a self-contained herd can readily be justified, because not only does the bull cost little to maintain, but the number of cows for which it is kept can be increased. And self-contained dairy herds are becoming increasingly important now that the attested herds scheme is operating.

Much nonsense has been talked about the incidence of abnormal calves in Dexter herds. Abnormal or imperfect calves occur in most breeds of cattle, and no domestic animal, with the possible exception of the cat, fails to throw monstrosities from time to time. There is no convincing evidence that the Dexter breed has more than its fair share of these. In fact, in recent years abnormal calves have become increasingly rare, due, it is thought, to the gradual elimination of genetically imperfect bloodstock. This, in itself, is a major achievement of great practical importance at a time when there is increasing demand for the beasts both at home and overseas.

Dexters have been exported to many parts of the world, including the Argentine, Australia, Canada, India, Palestine, Switzerland, South Africa, Kenya, and the U.S.A. In every instance they have adapted themselves to the climate and given satisfaction. In South Africa the breed has been known for a long time, probably due to the landing of animals from passenger-carrying sailing ships, in which they were kept to supply milk on the voyage.

The Dexter Cattle Society keeps a herd book to ensure that first-class breeding stock is maintained. The conditions for entry in this are generally similar to those required by other breed societies.

A. E. Richardson,
Secretary,
Dexter Cattle Society

TRACE ELEMENTS AND NUTRITION

It is regretted that the articles by Dr. Dunlop on copper and cobalt, foreshadowed in the May issue of this JOURNAL, have had to be held over indefinitely.

WINTERING STORE CATTLE

COCKLE PARK TRIAL, 1952-53

PROFESSOR H. C. PAWSON, M.B.E., M.Sc., F.R.S.E. and R. BRUCE, B.Sc.
King's College, Newcastle-upon-Tyne

THE trials, designed to compare the relative merits of different systems of winter store management, comprised four groups of weaned, spring-born, beef Shorthorn calves. As in 1951–52, comparisons were made between outwintering and inwintering of bullock steers and between two lots of inwintered heifer stirks. The conduct of the trials was essentially the same as that detailed in the previous report,* and all the feedingstuffs used were grown at Cockle Park. The daily rations fed to each group were as follows:

		Hay	Roots	Oats	Beans
		lb.	*lb.*	*lb.*	*lb.*
Lot 1.	10 bullocks, inwintered ..	10	10	1½	1½
Lot 2.	10 bullocks, outwintered	10	—	1½	1½
Lot 3.	8 heifers, inwintered ..	10	10	1½	1½
Lot 4.	8 heifers, inwintered ..	Grass silage to appetite			

Samples of silage fed were analysed by the Agricultural Chemistry Department of the University School of Agriculture, and samples of hay and swedes by the N.A.A.S. Nutrition Chemist for the Northern Province. The results of these analyses were:

	Dry Matter	Crude Fibre	Crude Protein	Digestible Crude Protein	Estimated Starch Equivalent	*p*H
	per cent	*Percentage of Dry Matter*	*Percentage of Dry Matter*	*Percentage of Dry Matter*		
Silage						
Lower layers ..	14.2	35.6	13.2	–	40	4.56
Upper layers ..	17.4	32.5	15.7	–	43	5.26
Hay ..	86.3	26.5	6.6	3.8	39	–
Swedes ..	10.0	–	1.2	1.0	64	–

The silage was of the light brown, acid type and varied considerably in composition. A sample of both the upper and lower layers of silage revealed a protein digestibility of approximately 58 per cent.

In Trial 1 with the bullocks, it was found that the hay consumption by the outwintered stock varied up to 10 lb. per head per day, with a mean daily consumption of 9.7 lb. per head. The daily nutrient intakes of Lots 1 and 2 were:

	Lot 1 (Inwintered)	Lot 2 (Outwintered)
	lb.	*lb.*
Dry matter	12.2	11.0
Digestible crude protein (D.C.P.)	0.9	0.6
Crude fibre	3.0	3.0
Starch equivalent (S.E.)	6.4	5.7
D.C.P.: S.E. ratio	1:7	1:9

*Published in the December 1952 issue of this JOURNAL, pp. 428-35.

Table 1
BULLOCKS
Wintered Outside v. Wintered Inside, 1952-53

LOT 1 10 Bullocks (Wintered Inside)	Ear Mark	Weight December 9	Weight Gain or Loss at Jan. 6	Weight Gain or Loss at Feb. 3	Weight Gain or Loss at Mar. 3	Weight Gain or Loss at Mar. 31	Weight Gain or Loss at April 28	Final Weight April 28	Average Weight Increase per Head
RATION PER HEAD PER DAY		*cwt. qr. lb.*	*lb.*	*lb.*	*lb.*	*lb.*	*lb.*	*cwt. qr. lb.*	*lb.*
lb.	8	5 0 26	20	26	16	8	44	6 1 0	
Hay 10	24	3 3 12	32	36	28	12	48	5 1 0	
Roots 10	44	3 2 18	34	28	12	40	50	5 0 14	
Oats 1½	23	4 2 20	36	44	24	18	38	6 0 12	
Beans 1½	10	4 1 22	34	24	36	20	52	5 3 20	154
	12	4 1 4	32	37	11	40	44	5 3 0	
	38	4 3 4	44	33	3	16	38	5 3 26	
	43	4 0 16	34	34	24	32	46	5 2 18	
	9	4 0 20	30	34	20	−16	62	5 1 10	
	29	4 3 12	34	46	24	31	49	6 2 0	
Mean		4 1 18	33.0	34.2	19.8	20.1	47.1	5 3 4	
LOT 2 **10 Bullocks** **(Wintered Outside)**									
RATION PER HEAD PER DAY	18	4 0 12	2	54	8	32	24	5 0 20	
lb.	2	4 2 20	8	32	20	30	24	5 2 22	
Hay* 10	32	4 2 0	0	16	36	12	26	5 1 6	
Oats 1½	25	4 0 24	14	42	−4	28	32	5 0 24	
Beans 1½	42	3 2 3	−5	6	12	20	20	4 0 0	94
	14	4 1 25	−9	40	24	41	45	5 2 26	
	37	3 3 3	−7	20	7	21	12	4 1 0	
	33	4 1 16	12	33	11	40	8	5 1 8	
	34	5 1 8	4	36	16	24	8	6 0 12	
*For actual amount eaten see p. 137.	6	5 0 4	0	16	8	24	20	5 2 16	
Mean		4 1 17	1.9	29.5	13.8	29.2	21.9	5 0 27	
Difference between means of Lots 1 and 2		— — 1	31.1	4.7	6.0	9.1	25.2	— 2 5	60

The individual liveweight gains for Lots 1 and 2 are given in Table 1 on p. 135. The inwintered bullocks gained more weight during the experimental period (December 9, 1952–April 28, 1953), and at the end of the trials were heavier than the outwintered stock. In spite of this, however, in April 1953 the latter were valued at £3 per head more than those which had been inwintered. When turned out to grass, the inwintered cattle did not gain weight as fast as the outwintered animals, but their total gain, taking the winter and summer periods together, exceeded that of the latter stock. This bears out the experience of the past, as follows:

Average Increase in Weight of Bullocks during Winter and Summer Feeding Trials, 1947-53

	1947-48	1948-49	1949-50	1950-51	1951-52	1952-53
	lb.	*lb.*	*lb.*	*lb.*	*lb.*	*lb.*
Outwintered	291 (235)	299 (186)	200 (148)	241 (179)	336 (194)	259 (165)
Inwintered	283 (142)	346 (145)	317 (176)	286 (104)	339 (169)	291 (137)

The figures in brackets represent the mean gains for the summer period of 14 weeks.

Grass Silage versus Mixed Ration The mean daily consumption of silage by the heifers in Lot 4 was 61.5 lb. per head, the actual amounts ranging from 51 lb. at the beginning of the trial to a maximum of 66 lb. A prolonged pre-trial feeding period is essential to get heifers accustomed to the silage, as evidence suggests that when animals are suddenly transferred to an all-silage ration the subsequent reductions in weight may not be fully recovered by the end of the winter period.

The daily nutrient intakes per head supplied in the mixed and grass silage rations were:

	Lot 3 (Mixed Ration)	Lot 4 (Silage)
	lb.	*lb.*
Dry matter	12.2	10.7
Digestible crude protein	0.9	1.0
Crude fibre	3.0	3.5
Starch equivalent	6.4	4.6
D.C.P. : S.E. ratio	1:7	1:4½

The Lot 3 heifers made greater liveweight gains than those fed grass silage, and in April 1953, they were valued at £1 per head more than the silage group. The individual gains of the heifers are recorded in Table 2 on p. 137. The following figures, based on actual costs of production of feeds at Cockle Park, show that the feeding costs of Lot 3 were 10.62 per cent less than those of Lot 4.

Constituent	Total Amount Consumed	Cost per Unit	Total Cost £	s.	d.
Hay	3 tons 15 cwt.	£5 per ton	18	15	0
Roots	3 tons 15 cwt.	£2 8s. per ton	9	0	0
Oats and beans	1 ton 2¼ cwt.	£13 per ton	14	13	0
Labour	126 man-hours	2s. 5d. per hour	15	5	0
	Total feeding costs of Lot 3		**57**	**13**	**0**

Constituent	Total Amount Consumed	Cost per Unit	Total Cost £	s.	d.
Silage	23 tons (approx.)	£1 10s. per ton	34	10	0
Labour	248 man-hours	2s. 5d. per hour	30	0	0
	Total feeding costs of Lot 4		**64**	**10**	**0**

Table 2

HEIFERS

Wintered Inside, 1952-53

LOT 3 8 Heifers	Ear Mark	Weight December 9	Weight Gain or Loss at Jan. 6	Weight Gain or Loss at Feb. 3	Weight Gain or Loss at Mar. 3	Weight Gain or Loss at Mar. 31	Weight Gain or Loss at April 28	Final Weight April 28	Average Weight Increase per Head
RATION PER HEAD PER DAY		*cwt. qr. lb.*	*lb.*	*lb.*	*lb.*	*lb.*	*lb.*	*cwt. qr. lb.*	*lb.*
lb.	40	3 3 16	28	28	16	28	34	5 0 10	
Hay 10	K4	3 3 16	28	36	16	34	54	5 1 16	
Roots 10	K3	3 3 20	26	38	16	30	42	5 1 4	
Oats 1¼	36	4 0 4	36	36	16	25	43	5 1 20	151
Beans 1½	31	4 2 24	40	−6	78	22	28	6 0 18	
	27	4 3 16	30	30	4	24	42	6 0 6	
	17	4 2 12	29	31	24	26	46	6 0 0	
	7	3 2 23	25	36	20	28	44	5 0 8	
Mean		4 0 23	30.4	28.6	23.8	27.1	41.6	5 2 7	
LOT 4 **8 Heifers**									
	11	4 0 8	12	12	14	16	−10	4 1 24	
	19	3 3 24	16	24	16	37	31	5 0 8	
	5	3 3 18	24	30	4	36	26	4 3 26	
RATION PER HEAD PER DAY	3	4 1 10	6	16	12	32	36	5 1 0	97
Grass silage to appetite	30	3 3 20	22	22	12	32	24	4 3 20	
	28	3 3 26	14	16	16	20	42	4 3 22	
	20	4 2 4	14	18	4	46	22	5 1 24	
	K5	4 0 0	12	13	0	35	4	4 2 8	
Mean		4 0 10	15.1	18.9	9.9	31.8	21.9	4 3 24	
Difference between means of Lots 3 and 4		— — 13	15.2	9.7	13.9	4.7	19.7	— — 67.0	54

Conclusions Greater liveweight gains were made by inwintered bullocks and heifers fed on a ration of hay, roots, oats, and beans, than by either outwintered bullocks or inwintered, silage-fed heifers. When turned out to grass in the spring, the outwintered bullocks and silage-fed heifers gained weight more quickly, but a comparison of liveweight gains over the combined winter and summer periods favours those groups inwintered on a mixed ration.

The writers wish to acknowledge the valuable assistance given by Mr. P. P. Brennan, B.Sc., Acting Manager, and Mr. S. Pile, Assistant Stockman, in the conduct of the trial.

FARMING AFFAIRS

Keeping Up Farm Income With the publication of this year's price review and with food rationing coming to an end, many farmers are wondering what the future is likely to bring. The lower prices announced for pigs, milk and (next year) for grain will, if other things remain equal, reduce the income of many farmers. What can they do to minimize this tendency? The answer in any particular case will naturally depend on local circumstances, but we can nevertheless lay down some general principles. The first course a farmer can adopt is to try and increase efficiency and cut down costs. The second is to increase production without increasing costs proportionately. The third course is to revise the farming system to produce more of the things for which there is a good demand.

How can costs be reduced in practice? One reaction to lower prices might be to cut down expenses all round. Cutting out waste is always to the farmer's advantage. But an indiscriminate reduction of expenditure might well leave the farmer worse off than before. Take fertilizers for example. Much of the cost of growing a crop is made up of fixed costs like rent, labour and machinery costs. These do not change very much, whether the yield is high or only moderate. Thus the higher the yield, the less will be these fixed costs per ton or per quarter produced. In most cases, this fact far outweighs the cost of extra fertilizers required. It is, of course, possible to use too much fertilizer; but, in practice, there are probably ten farmers using too little for one who is using too much.

The same principle applies with even more force to livestock production. A recent countrywide survey of dairy herds showed that profits per cow ranged from £8 in herds giving around 410 gallons per cow up to £54 for yields around 1,000 gallons. The advantages of high yields can be put in another way. Suppose a farmer aims at producing 10,000 gallons a year. He could do this with 20 cows giving 500 gallons a year. These, with their followers, might require 70 acres of grass and crops. Alternatively, he could get the same total yield from 10 cows giving 1,000 gallons each. Even if extra concentrates are grown on the farm, these cows should require no more than 45 acres. Thus not only will these 10 high yielding cows give more profit than the 20 low yielding ones, but they will save 25 acres of land that can be used for cash crops or some other livestock. It may, of course, take much care in breeding, selection and rationing to raise milk yields, but the result is well worth the effort.

Although an increase in yields may often be the best way to lower costs, there is frequently scope for a direct reduction in expenses. On most farms

the labour bill is the largest item: it generally accounts for about a third of total costs. Saving labour is too often taken to mean heavy expenditure on machinery, but this need not be necessary. Taking the country as a whole, about half the working time in farming is spent in the care of livestock—much of it around the farm buildings. It is here that substantial savings are possible.

A recent Cambridge survey has shown that some farmers use three or four times as much labour in looking after the same number of dairy cows, fat cattle or pigs as do other farmers—and without any appreciable difference in production. Saving labour is not a matter of speeding up workers, but of cutting out unnecessary drudgery. Some farmers are handicapped by old and unsuitable buildings. But it is surprising how much unnecessary work can be eliminated at quite a modest cost by locating food near the stock, by placing food troughs where they can be easily filled, or by other simple measures of this kind.

The next most important charge after labour is for fuel and machinery, and this accounts for up to 20 or 25 per cent of total costs—especially on arable farms. Before buying an expensive implement, a farmer should reckon up carefully to see whether it is worth its cost to him. It is not enough to save "man-hours" or to make work easier—the implement must produce a real cash saving in wages. This saving should be more than enough to pay for the upkeep of the machine and write off its purchase price in, say, five or six years. In many cases, a better alternative to cutting down wages is to try and find whether the time saved can be used to expand production or start a new enterprise. As this extra production is obtained without extra wages, it can often provide a very profitable addition to the farm output. But if the machine neither saves wages nor allows an increase in output, it is an expensive luxury.

With the present change in emphasis from maximum output to production at lower cost, it is not surprising that there is now a greater demand from progressive farmers for economic advice—particularly for standards against which they can measure the efficiency of their farms. When a farmer is thinking of modifying his farming system, he may also wish to estimate the effect on his income. This development has been anticipated by the advisory services. With the help of the agricultural economists at the universities, practical standards of performance and methods of budgeting are being perfected. They are simple to use and do not require the keeping of an elaborate set of records.

Although it would be rash to make forecasts, agriculture seems destined to play a much more important part in the economy of the country today than it did before the war. Difficulties may arise, but the successful farmer is likely to be the one who can adapt his programme to suit changing conditions and who places the emphasis on high yields and good quality.

F. G. Sturrock

Farming Cameo: 42. South Cardiganshire This area of Cardiganshire comprises the Teifiside rural district and embraces approximately 71,000 acres, including 4,500 acres of rough grazings. It is bounded on the east and south by the River Teifi, noted for its coracle fishing, and on the west by the rugged coastline of Cardigan Bay. The district is therefore exposed to the prevailing south-westerly winds, and it experiences relatively mild winters with a high annual rainfall—conditions which have had a pronounced effect in moulding the predominantly grassland type of farming practised. Altogether, there are 1,407 holdings in the area

returned as being over one acre, but of these 60 per cent are under 50 acres and 82 per cent under 100 acres. It is obvious, therefore, that the rural economy is, to a very large extent, based upon the family farm.

The Teifiside district has always been regarded as possessing the best agricultural land in the county, and in the past some of the land adjoining the sea coast was popularly known as "the seed corn granary of west Wales". Soils vary from deep alluvial in the Teifi Valley, where there are some very good pastures, to acid peats on the open moorland, known locally as "Rhos", at elevations of between 850 and 1,100 feet. The majority of the cultivated land is of a medium to light loam in character, varying from 5 to 9 inches in depth and overlying a soft, acid shale. Liming is therefore essential to successful cropping—a fact appreciated by most farmers. Both arable and permanent pastures have high phosphate requirements, and during the last few years considerable responses have been obtained by the use of potash salts, especially on temporary leys. In addition, more compound granular fertilizers are being used to supplement the farmyard manure and basic slag which, until 1939, were about the only dressings carried out. As a result of its rather undulating nature, the whole district is well drained, except for a few small areas of medium soils overlying heavy clay, but, on a number of farms, the absence of adequate water supplies to buildings and fields is a real deterrent to maximum and efficient food production.

In common with the rest of west Wales, there has been a complete change-over during the last twenty years from the traditional store cattle rearing to milk production. The old farm rotation of corn—corn—roots—corn—4–5 year ley, together with a block of permanent pasture (usually inaccessible slopes), still remains the basis of the cropping programme, although considerable changes have taken place in the type of crops grown and their subsequent utilization. During the last five years there has been a 90 per cent increase in the acreage of kale and cabbage and a corresponding decrease in the total acreage of potatoes, mangolds and swedes. More rape is grown for winter consumption, and most of the green crops are now consumed *in situ*, using the electric fence.

The excellent climate makes grass the key crop of the area: in fact, grass accounts for some 72 per cent of the clear agricultural land in the district. Its value to stock is being increasingly appreciated, and new techniques for its utilization by silage-making, drying, strip- and rotational-grazing are finding greater favour. However, there is still plenty of scope for the increased use of fertilizers, especially nitrogen.

The Dairy Shorthorn and British Friesian are the two main dairy breeds, having completely replaced the native Welsh Black cattle. The district is fully attested and, at present, approximately 55 per cent of the herds produce designated milk. Local farmers are very keen to secure designated licences for milk production and, but for the shortage of skilled craftsmen and water difficulties, the percentage of licensed herds would be much higher. More dairy farmers could, with advantage, use colour-marking bulls on the low milk-yielding cows in the herd, and, given better management techniques for the grass, substantial increases in profit should be possible.

On the larger farms in the Llandyssul-Rhydlewis area there is an acute shortage of labour. In consequence, grassland flocks of sheep are replacing the dairy cow. Few pigs and poultry are kept on the general farm; there is a definite tendency to leave them to the specialist keeper. Over the last six years there has been a steady decline in poultry numbers, but the pig population has more than doubled.

All indications are that the filling of the milk churn will remain the focal point of production in the district, which is fortunate in being well served by modern milk factories.

G. M. Jones,
District Advisory Officer

The Mechanic on the Farm: 3. Working with Wood The farm mechanic is likely to think more about metalwork than about woodwork; nevertheless, carpentry is an important agricultural craft, for the repair of gates, trailer bodies and other equipment made of wood calls for skills to be learned and for tools to be provided in the farm workshop.

In woodworking, the suitability of the tools, the way they are used, and the condition in which they are kept make all the difference between quick and slow work, and between good and bad results. A well-sharpened saw skilfully used cuts easily, accurately, and much faster than a wrongly-set saw badly handled.

When the cut is to be made along the direction of the grain, the saw should be kept at an angle of about 60 degrees to the work. Long strokes should be used but very little pressure is needed. The saw cut must be kept vertical; it is sometimes worth while to use a try-square from time to time to make sure that the saw is being held upright. When a plank is being sawn across the grain, the saw should be held at an angle of about 45 degrees to the surface.

A cranked brace and bit or a breast drill will be used for boring holes in wood. As soon as the leading screw of the drill breaks through the wood on the other side, the bit should be pulled out and started in again from the opposite side to prevent splintering. When the bit is being pulled out of the hole, it should be rotated in the forward direction so that it will clear out the chips of wood. If the bit is turned in the reverse direction while it is being withdrawn, some of the chips will be left behind.

Most carpentry consists basically of joining together two or more pieces of wood. For much rough constructional work, a simple lap-joint is quite adequate, the wood being cut to length and nailed or screwed in the same way as in making packing boxes. But care should be taken to see that the size of screw or nail is suitable for the thickness of the wood.

When a screw is used to hold two pieces of wood together, it should be forced into the far piece of wood only. The hole bored in the near piece to receive the screw should be large enough for the shank of the screw to rotate in it freely. When the screw bites its way into the second piece of wood, the two will be drawn together and held securely.

For starting small wood screws, a hole can be made by bradawl, but for large screws it is better to use a gimlet. The difference between the two tools is that the gimlet removes the wood from the hole, whereas a bradawl forms the hole merely by compressing the wood around it. Making a hole by bradawl may cause the wood to split.

H. J. Hine

Increasing the World's Food World population continues to increase at an ever-accelerating pace. In the areas for which reasonably accurate figures are available, an annual increase of 1.3 per cent for the ten years to 1948 has now risen to 1.5 per cent, and realistic forecasts for the future suggest no change in the present trend. So each day brings an additional 80,000 people clamouring for a share in the world and its goods.

It is generally supposed that the greatest increases in population occur in the under-developed parts of the world, and while it is true that few of the areas in this category can claim declining birth rates, some of the more industrialized countries, such as Japan and India, certainly can. What is perhaps not so widely realized is that striking increases in population are occurring in some of the highly developed countries—the United States, Australia, Canada and the Argentine, for example—a fact not without significance to the food importing countries.

With the wide development of health services in all areas, people everywhere are also holding on to life a little longer; and it is this lengthening life span, coupled with the present rate of reproduction, which brings the task of increasing the food supply into the first category of urgency since, without it, there can be no significant improvement in living standards, nor can there be a secure foundation upon which an expanding world economy can be established and maintained. As a guide to countries in the preparation of plans for agricultural development, the F.A.O. Conference, meeting in 1951, recommended that all Governments should aim at a food production increase at the rate of 1–2 per cent above the level of the rising population as the minimum necessary to achieve a significant improvement in nutritional standards.

Each year the Food and Agriculture Organization examines statements and estimates of agricultural production submitted by member countries, from which it prepares and publishes a world statement of the production and consumption of basic foods and other essential agricultural products, thus providing an annual milestone by which countries can measure their progress towards the common goal. The current edition of *The State of Food and Agriculture* has, for the first time, been issued in two parts.* Part I provides a summary of the more important achievements and problems, reviews the food situation in each region and comments, commodity by commodity, on the developments which have taken place. Part II, in which will be found much to interest the technical reader, deals with the longer term prospects, based upon Government plans as reported to the Organization, and sets out the major problems affecting the issue.

Pride of place in an attempt to feed a hungry world must be given to the search for yet more land. The search has not gone unrewarded in the Near East and in Latin America, where the contribution from the Argentine may well be the most significant factor in reaching the regional objective. Elsewhere, hopes are centred on the development of the land and water resources through irrigation, drainage, reclamation of saline areas and flood control. This field is undoubtedly capable of striking development, and, probably as a result of the visible improvement of the crop-bearing potentiality of an area, projects of this nature tend to receive an over-generous share of national investment. Where financial resources for land development are inadequate, as so often is the case, it is possible that too great a proportion may be diverted to programmes for the expansion of the cultivated area, and, in consequence, too little goes towards the development of such complementary factors, such as improving soil fertility, the production of improved seed, prevention of losses during and after harvest, and to the control of plant and animal diseases.

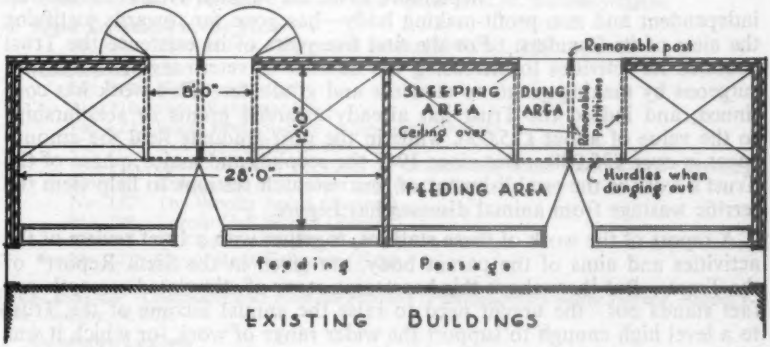
Effective programmes in these related fields would seem likely to affect a far greater number of farmers than the larger, and more spectacular, land

* *Part I. Review and Outlook*; *Part II. Longer Term Prospects.* Obtainable from any sale office of H.M. Stationery Office, or by post from P.O. Box 569, London, S.E.1., price 5s. each part (5s. 3d. by post).

reclamation projects. Such programmes, however, demand a greater investment in Government extension services than is at present the case in many countries. In the last resort, however, it may well be that if steady and sustained progress is to be made in bridging the dangerous gap between the well-fed, and the ill-fed, countries, more attention will have to be given to increased investment in a country's human resources—the use of the native knowledge, skill and ingenuity to ensure that the physical resources are more fully developed.

J. Anderson

Adaptable Pig Housing The remarkable growth of the pig population in Britain over the last few years has been accompanied by an increasing interest in various systems and designs for fattening houses. These designs have fallen into two main classes—those which are specialized and suitable only for fattening pigs, and those designed with a view to adaptability, bearing in mind the needs of the pig if it is to be an efficient converter of feedingstuffs. There are many who say that first and foremost one should seek the ideal for the pig and pay no regard to adaptability. Possibly this is right where swill and whey are available, and for the market-gardening smallholder who will always keep pigs to use up waste products. The general farmer, however, particularly if he has a long memory, often wishes to safeguard himself against a change in farming conditions by having adaptable buildings. It was to meet this latter need that the building described in this note was evolved.



The accompanying illustration shows the general arrangement of the pig pens. The following are the main features. The total width of the building is nearly 17 feet and the minimum headroom within it is over 7 feet—useful measurements for many types of farm building. The length of the building is a multiple of the 14 feet allowed for each pen, and this lends itself to subdivision, if desired, into lengths of 3 feet 6 inches for standings in a cowhouse or milking parlour. The troughs are arranged along one common feeding passage, which makes for ease of feeding. The outside walls are of cavity construction and the roof is insulated, which means that the building is warmer in winter and cooler in summer than it would be if the walls were solid and the roof consisted of one thickness only. The concrete floor may be insulated or straw-covered for warmth.

Each main doorway is a generous 8 feet wide, and is divided by a movable central doorpost into two equal doorways when the building is being used for pigs. If necessary, however, the full width would permit the entry of implements. The sleeping area of each pen is screened by a wall (so that there is no risk of the pigs lying in a draught) and provided with a low ceiling, so that the heat generated by the pigs is confined in a small air space—actually about 30 cubic feet per pig. A separate dunging area is provided for each pen, which can be cleaned out daily (as in a Danish piggery), or kept full of straw and mucked-out periodically (as in a "deep straw" piggery). Moreover, the partitions between the dunging areas can be removed to facilitate cleaning. Doorways are provided in the trough line so that pigs can be moved in and out of the pens by way of the feeding passage if it is not desired to use the main doorways. The pens can be used with or without outside runs. Except in the pens at either end of the building, the sleeping areas adjoin one another in pairs, back to back or side by side, so that the pigs can lie on both sides of the same wall, thus helping to prevent loss of heat.

When this building is compared with any other of the well-known types of fattening house, it will be seen that it incorporates most of the good points of all of them and few of the bad ones. At the same time, it is highly adaptable—a point which has hitherto defeated most designers of pig-houses.

N. B. Wood

The Animal Health Trust In the eleven years since it was established in September 1942, the Animal Health Trust—an independent and non-profit-making body—has gone far towards justifying the aims of its founders. For the first five years of its existence the Trust confined its activities to increasing the number of veterinary scientists and surgeons by making grants to students and graduates. This work has continued, and indeed the Trust has already awarded grants or scholarships to the value of about £25,000, while in the post-graduate field the amount spent is over £35,000. But since 1947 the second, and major, phase of the Trust's work is the establishment of four research stations to help stem the terrific wastage from animal diseases has begun.

A report of the work of these stations, together with a brief review of the activities and aims of the parent body, are given in the Sixth Report* of the Trust. But throughout this heartening story of stimulated research one fact stands out – the urgent need to raise the annual income of the Trust to a level high enough to support the wider range of work for which it was instituted. Bloodstock owners and allied interests have, by their donations, made the Equine Station virtually self-supporting, and those interested in dogs have made the Canine Station nearly so. It is now up to the agricultural industry to follow their example with the Poultry and Farm Livestock Stations.

The investigations at present being carried out by the two agricultural stations cover a wide field. Coccidiosis in chickens, blackhead in turkeys, fowl pest, Johne's disease in cattle, pig ailments and twin-lamb disease in sheep are only a few of the problems being tackled here. But much more remains to be done. In the financial year ended June 30, 1953 the report shows that over £12,000 was spent on these two stations in excess of contributions. If then their valuable work is not to be curtailed, more support

* Available to members only. Minimum membership fee one guinea per year.

must be forthcoming. And there can be no firmer financial foundation for the future than a large number of small subscriptions coming in regularly. Full information on the part you can play in this battle against disease can be obtained from the General Secretary of the Trust, 232-5 Abbey House, Victoria Street, London, S.W.1.

THE MINISTRY'S PUBLICATIONS

Since the date of the list published in the March 1954 issue of AGRICULTURE (p. 590), the undermentioned publications have been issued.

MAJOR PUBLICATIONS *Copies are obtainable at the prices quoted from the Sale Offices of H.M.Stationery Office or through any bookseller.*

Bulletins

No. 104 Cider Apple Production (*Reissued*). 3s. (3s. 2d. by post)
No. 148 Incubation and Hatchery Practice (*Revised*). 3s. (3s. 2d. by post)

Other Publications

Co-operative Farms with Centralised Services in Wales: Reports and Accounts, 1952-53 (*New*). 2s. (2s. 1½d. by post)

Smallholdings Organized on the Basis of Centralised Services: Land Settlement Association Annual Report, 1952-53 (*New*). 1s. 3d. (1s. 4½d. by post)

Report of the Advisory Committee on Myxomatosis (*New*). 9d. (10½d. by post)

LEAFLETS *Up to six single copies of Advisory leaflets may be obtained free on application to the Ministry (Publications), Chester Terrace, Regent's Park, London, N.W.1. Copies beyond this limit must be purchased from the Sale Offices of H.M. Stationery Office.*

Fixed Equipment of the Farm

No. 20 Electricity for Farm and Estate (*New*). 9d. (10½d. by post)

Advisory Leaflets

No. 110 Frit Fly (*Revised*)
No. 118 Goat Keeping (*New*)
No. 122 Sugar Beet: Sowing to Singling (*Revised*)
No. 160 Swift Moths (*Revised*)
No. 178 Stem and Bulb Eelworm on Cereals and other Farm Crops (*Revised*)
No. 180 Cultivation of Raspberries (*Revised*)
No. 187 The Woolly Aphid (*Revised*)
No. 196 Turnip Gall Weevil (*Revised*)
No. 419 Cultivation of Spinach (*New*)
No. 421 Cereal Root Eelworm (*New*)

FREE ISSUES *Obtainable only from the Ministry (Publications), Chester Terrace, Regent's Park, London. N.W.1.*

Growmore Leaflets

No. 49 Herbage Seed Mixtures (1954) (*Revised*)
No. 104 Peas and Beans in the Garden (*Revised*)
No. 110 Fowl Pest (*New*)

Other Leaflets

Suggested Seed Mixtures for Welsh Grassland (*Revised*)
National Growmore Fertilizer (*Revised*)
Marginal Production Scheme (*New*)
Myxomatosis (*New*)
Grants for Eradication of Bracken (*New*)
Guide to the Home-grown Cereals Deficiency Payments Scheme, 1954 (*New*)
Farmers' Guarantees for the 1954 Harvest: Oats, Barley and Mixed Corn Crops (*New*)
Farmers' Guarantees for the 1954 Harvest: Wheat and Rye (*New*)
Farmers' Guide to the Fatstock Guarantee Scheme, 1954–55 : Cattle
" " " " " " " Sheep
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BOOK REVIEWS

Black's Veterinary Dictionary (3rd Edition). WILLIAM C. MILLER and GEOFFREY P. WEST. Adam and Charles Black. 50s.

For a quarter of a century, *Black's Veterinary Dictionary* has been the standard veterinary reference book of English-speaking animal owners in all parts of the world. By its concise yet lucid descriptions and the sheer simplicity of its language, it has done more than any other work to assist the veterinary profession in its efforts to dispel the remnants of mysticism and ignorance, which for generations attended the keeping of animals and the treatment of their ailments. But veterinary science has progressed in the eighteen years which have elapsed between the appearance of the second and third editions ; new diseases have been recognized and the evolution of new treatments has made rapid and complete recovery commonplace in cases which, only a few years ago, would have been deemed incurable ; while wider application of veterinary preventive medicine has, during the same period, gone far towards minimizing the heavy losses caused by some of the more troublesome epizootics. The book therefore stood in considerable need of revision.

The third edition of the Dictionary describes and explains the latest advances of veterinary and allied sciences in language which readers can easily understand. It is virtually a new book for, although it retains the high standard and format of previous editions, it has been almost entirely rewritten to bring each section and reference into line with modern thought and knowledge. Some well-reproduced new plates show a wise choice of subjects ; those depicting modern treatment of fractures are particularly enlightening. Points raised in the sections are also effectively illustrated by a large number of line drawings interspersed throughout the text, although a few of the latter have unfortunately suffered in the process of reduction and reproduction. The production of the Dictionary is of the quality that previous works of the authors and publishers have led readers to expect. It is an excellent book which should be possessed by everyone who keeps an animal.

A.A.F.

The Principles and Practice of Feeding Farm Animals (4th Edition). E. T. HALNAN and F. H. GARNER. Longmans. 25s.

When a book is so well and widely known and enjoys such a high reputation as this one, the reviewer can only note improvements in the text and suggest points that might be taken into consideration in future editions.

The most striking improvement in the fourth edition is the greater emphasis on the self-sufficiency principle, as shown by a considerable enlargement of the sections dealing with the use of grassland and silage, and the increased stress laid on fodder crops, including fodder beet, which is introduced in this edition for the first time. But since the authors have rightly chosen to recognize this economic trend, it is rather unfortunate that throughout the volume costings are based on pre-war figures, with the result that comparisons frequently bear no relation to present-day conditions. The section on vitamins has been brought up to date and considerably expanded in the process, but a more consistent effect would have been obtained had corresponding amendments been made to the text throughout the book, where continued reference to "vitamin G", the out-dated American term for the B_2 complex, can only be misleading to the farm student. More detailed reference to trace elements in animal feeding and a stronger emphasis on the correct supplementation of rations for young and breeding stock with vitamins and trace elements to promote animal health and production and prevent disease, would also be an improvement.

These points should only be regarded as constructive criticism of a new edition. The basic fact remains that this book still stands as a most lucid and comprehensive treatise for practical farmers and farming students alike, and one which provides a broad and, in most cases, a detailed study of the various aspects of animal husbandry. The treatment is logical and easy to follow, with a nice balance between the theoretical and practical.

H.H.W.

The Channel Islands. (County Books Series). WILFRED D. HOOKE. Hale. 18s.

The ever-increasing popularity of the Channel Islands as a tourist centre has inevitably resulted in the appearance of a positive galaxy of guide books about the area, so that at first glance it would appear that this County Book offering has been born into an already overcrowded world. Fortunately, Mr. Hooke's book is no mere list of beauty spots or catalogue of local facilities. On the contrary, it is a well-illustrated and absorbing account of the history and life of the islands, full of intimate detail and bearing testimony to a good

deal of research. Its author, though not an islander by birth, has lived much of his life in the islands, and his knowledge of the area is apparently rivalled only by his obvious appreciation of its great natural beauty.

The opening chapters deal fully and faithfully with the turbulent history of these British outposts – a history which has been characterized from Roman times by periodic invasion from the sea, culminating in the German occupation in the last war. (The latter, incidentally, left one particular landmark – an underground hospital – which today provides the States of Jersey with a most lucrative income from visitors!) For since they came under British rule at the time of William the Conqueror, the islands have, as Mr. Hooke so aptly puts it, "been on the wrong side of England's moat". Alderney, for example, is only a matter of eight nautical miles from the French coast. Such close association with France has left its legacy. French influence is still discernible in a dozen and one different forms – ancient dues are still levied ; old customs, such as the strange but speedy legal process of "Clameur de Haro", remain. In fact, the governmental structure appears to owe far more to feudal Normandy than to democratic Westminster.

Agriculture – the islands' principal industry – is wisely given a chapter to itself. The author harks back briefly to the past of cereal-growing and cider-apple orchards, giving, in passing, a most diverting account of the ceremonial surrounding the making of that old apple delicacy known as "black butter", before describing the present cash cropping of flowers, fruit, tomatoes and potatoes. Our attention is also drawn to the very real difficulties of the islands, such as Colorado beetle and Potato eelworm attacks, and the water supply problems of the glasshouse industry of Guernsey. Inevitably, too, there is mention of the two famous dairy breeds of cattle of which the Channel Islands are so justifiably proud.

As elsewhere, the islands have their peculiarities and problems, and the picture of them as lands flowing with milk and honey, so commonly painted after the war, is just not true. Nevertheless, as many thousands of Britons will testify, they are well worth visiting. And I can suggest no better companion than Mr. Hooke's *Channel Islands*.

L.W.T.

Beef Production. M. M. Cooper. Nelson. 12s. 6d.

Professor Cooper appears to have attempted in *Beef Production* to write a book which will be of use to farmer, adviser, and student, alike. Let it be said at once that he has achieved a fair measure of success. There is something for everyone in this comprehensive work on a subject of great national importance. Moreover, with beef production in this country once again at the crossroads, he has chosen his time well.

The first part of the book deals with the more standard knowledge and data relating to the subject, whilst the latter part is mainly concerned with the practical, technical and economic problems of breeding, rearing and fattening. In my opinion rather too much space has been taken up with standard work – a point that is made all the more obvious in the later chapters, where the subjects have given the author scope for the expression of a good deal of original thought.

The historical aspects and the contributions of the various early improvers of British cattle are dealt with admirably, and the chapters on breeding and selection are notable for their clarity – which is indeed a feature throughout the book. The section on growth and development of a beef animal and their relationship with quality in beef itself, summarizes concisely yet adequately the fundamentally important work of Dr. John Hammond and other workers in this field of research. There are interesting reviews, too, of the sources of our beef supply, the methods by which quantity and quality might be improved, the contribution which dual-purpose cattle and some of the dairy breeds, notably the Friesian, can make to the supply, and the role of our hill and marginal lands. The observations on all aspects of winter and summer fattening and some thoughts on possible future practice will be read with interest, as will also the final chapter on the economics of the beef industry.

The book is written in Professor Cooper's characteristic style – easy to read, factual, and with many references to recent experimental work. Throughout it portrays the author's progressive outlook, his respect for tradition and, not least, his regard for the well-being of British agriculture.

W.R.S.

Farming Records and Accounts. JAMES WYLLIE. Butterworths Scientific Publications. 30s.

Probably no economist in Britain has had more experience of the keeping of farm records and their uses than Mr. Wyllie, and in his book he explains how to keep all those that are necessary for simple farm accounts and for the more complicated cost accounts, and how the accounts themselves are completed and subsequently made use of. And what purpose do they fulfil? The answer Mr. Wyllie gives that accounts are diagnostic in aim and are not directly curative is disappointing. He is, however, more optimistic when he deals with efficiency standards, for these, he says, not only help in determining the level of managerial efficiency but also must help in diagnosing the causes of inefficiency in the management and in suggesting how this inefficiency should be treated. Yet, while he wisely emphasizes the dangers of using efficiency standards without caution, it is tantalizing to find so little about their positive uses.

This book will confirm in their beliefs those who claim that the value of recording is confined to diagnosis. In the last chapter, however, Mr. Wyllie develops the general principles of budgeting. Budgeting approaches farm management problems from an entirely different angle from cost accounting or any of the other more traditional methods. It attempts to measure what might be the result of doing things which are not being done at present, and whether the extra return of doing them would be greater than the extra cost involved. More precisely, it is concerned with marginal costs and marginal returns, whereas the accountant concerns himself with the average. Yet to try to discuss such a big subject as budgeting in fourteen pages (cost accounts receive sixty-six pages) is fair neither to the subject nor to the writer himself; and in his final paragraph Mr. Wyllie admits that there may have been some bias in his views.

But if Mr. Wyllie seems to be painting the virtues of accounting compared with budgeting in colours which are as variegated as he claims the farming industry itself to be, one cannot dispute the fact that the records which are the basis of accounting are also the basis for any work in farm management. Without them, the difficulties of both diagnosis and cure are enormously increased, and by their use all methods are strengthened, so that Mr. Wyllie has done a valuable service in describing so lucidly just how each record should be kept and how it fits into its appropriate system of accounting.

W.H.L.

Estate Finance and Business Management. C. W. N. MILES. Estates Gazette Ltd. 22s. 6d.

In recent years young land agents have found in their professional examinations an increasing interest in the financial aspect of land ownership. We are living in times that drive a landowner to regard his function of landownership as an activity which should be conducted on business-like lines. It follows, therefore, that land agents have to concern themselves more and more with estate finance generally and, in particular, the finance of improvements on each holding. There has been a growing need for a book such as Mr. Miles has now produced.

The preface to *Estate Finance and Business Management* says that it was written with the syllabuses of the professional societies' examinations in mind, but it should be made clear that the appeal of this book must go beyond the student, and owners and agents will read it literally with profit. Its special attraction lies in the fact that in one volume has been assembled information which hitherto has only been available from very scattered sources. The book marks the emergence of Estate Finance as the separate and special subject that it undoubtedly has become.

An early chapter is headed "Investments other than Land"; and the need for such a chapter is obvious if we are to regard investments in agricultural land in their proper perspective. The next chapter—"Estate Companies"—has been written most clearly by Mr. W. T. Dent, and is a contribution which will command widespread interest. No less than three chapters are devoted to maintenance and improvement, and all aspects of these subjects are clearly and simply explained. A chapter on the position of settled estates is also worth particular mention as likely to be of considerable appeal and value to readers.

The book is remarkably condensed and is of a handy size. The index stands up to test and there is a bibliography which is surprisingly short. It seems inevitable that future editions, to which this book must run, will grow thicker, and Mr. Miles will do very well if he can maintain the present excellent quality of the book, which can be regarded as one of the most important the land management world has seen for many years.

R.G.A.L.

Starch and its Derivatives. Vols. I and II (3rd Edition). J. A. RADLEY. Chapman and Hall. 65s. each.

The present treatise on starch technology forms one of a series of monographs designed to give as complete an account as possible of recent progress in a number of important branches of applied science and chemical industry. The first edition appeared in 1940, but so sustained and intensive is the interest of research workers in the subject of starch, that it became necessary within less than a year to start preparing a revised and enlarged edition. This second edition was published in 1943. Then followed a decade which proved remarkable for the progress made in the elucidation of many problems associated with the structural and technological aspects of starch. This new body of information has been incorporated in the latest edition. The result is a notable work that may justifiably claim to present as complete and up-to-date a picture of the chemistry and technology of starch and its derivatives as is possible in the case of such a rapidly expanding subject. In seeking to achieve this purpose, the author has had the assistance of a number of prominent authorities, both British and American, who have contributed sections dealing with specialized branches of the subject in which they themselves are particularly interested. This has lent further distinction to the work.

The new edition has been issued in two volumes. Vol. I deals comprehensively with the structure and reactions of starch, and with the amylases and their action on starch: Vol. II is devoted to a detailed consideration of such matters as the manufacture of the starches and their derived products from the various cereal grains, the potato and other sources, and the properties, methods of determination and industrial applications of the starches and starch products.

Readers who are familiar with the earlier editions will look forward to possessing the new and up-to-date version. It may confidently be predicted, however, that the new volumes will attract many additional readers among those students and research workers in the fields of both pure and applied science who are interested in the numerous aspects of the chemistry and technology of starch and the other important plant products.

H.E.W.

Controls and Subsidies on Agricultural Products and Requisites: I. Meat and Livestock, 1939–53, II. Hill Sheep and Hill Cattle Subsidies, 1939–53. H. FRANKEL. Agricultural Economics Research Institute. 2s.

This is the second in a series of publications by the Agricultural Economics Research Institute dealing with controls and subsidies on agricultural products, etc. The first, published in December 1953, dealt with the marketing of pigs, bacon and eggs over the same period.

At a time when controls are being lifted and the marketing of fatstock is being returned to private traders, it is useful to have on record a summary of the fatstock marketing arrangements in the interregnum of State control. In retrospect, it perhaps seems rather surprising that those arrangements, introduced as they were at a very early stage of the war, could have operated so effectively and so successfully. The fact that they did is a tribute to the Ministry of Food, the meat traders, farmers and others concerned in regulating the marketing of over 1½ million tons of meat annually in a period of national emergency. Mr. Frankel has amassed his facts carefully and, since official sources of information have been used whenever possible, his summary is as authoritative as can be made by an independent writer. A great deal of information has been condensed in some fifty pages, and this booklet will make a compact supplement to the official histories. Fortunately, the author has avoided overburdening the text with tables of statistics. He presents a coherent, historical survey which makes interesting reading but avoids contentious issues.

There are, in Part I, separate sections dealing with meat marketing; commissions and fees paid to collecting centres and other agents of the Ministry of Food; the remuneration of wholesalers, importers and retailers; and the total costs of distribution, including Ministry of Food trading losses. Part II summarizes the subsidy provisions for hill sheep and hill cattle and is rather more limited in scope and appeal than the first part.

Although this publication does not itself discuss whether the controls and subsidies adopted were the best or cheapest means of securing the ends desired, that question—and many others—will come to the mind of those who read it. Some lessons can be taught only by experience: it is to be hoped that all the publications in this series will in due course be gathered together by the Research Institute so that an abstract of the experience of the past fifteen years of controls will be readily available in one volume.

L.N.

Electricity on the Farm. British Electrical Development Association.

First issued in 1947, this booklet is an old favourite now brought up to date by a thorough revision. Like all the B.E.D.A's technical publications on rural electrification, it is both authoritative and attractively produced.

The first chapter deals very briefly with supply problems and tariffs, and is intended mainly for farmers who still have to consider such alternatives as two-part or block tariffs, and single- or three-phase supply. There is just enough here to indicate some of the questions that the farmer will want to ask the supply authority. Chapter II, entitled "What a Unit of Electricity Will Do", indicates something of the wide range of applications of electricity on farms, and gives a guide to the running cost of electric motors for driving such common items of equipment as milking machines, water pumps, and hammer mills, and of heating, lighting and household appliances.

Subsequent chapters give some general information on lighting, water supply, power in the barn and farmyard, crop drying, milk production, poultry and egg production, pig-rearing and miscellaneous applications. In the main, the treatment of these subjects is non-technical and is less detailed than in the "Farm Electrification" series of handbooks also published by the Association. The booklet, which is well illustrated with photographs of electrical equipment in use on farms, concludes with chapters on the electrical installation (wiring etc.) and the uses of electricity in farmhouse and cottage.

It is no exaggeration to say that this publication could be read with advantage by almost every farmer who has an electricity supply available or within reach. Copies are obtainable free from most electricity supply centres, or direct from the British Electrical Development Association, 2 Savoy Hill, London, W.C.2.

C.C.

Proceedings of the British Weed Control Conference, 1953. 30s.

The full report of the twelve papers, thirty-three research reports and discussion at the First British Weed Control Conference, which was held at Margate in November 1953, has now been published.

The papers deal with the cost of weeds; weed problems in forestry, grassland, fruit and vegetable crops; weed seeds; and spraying problems. Specific aspects of weed control, such as the effects of 2,4-D and MCPA on cereals, comparisons of 2,4-D and MCPA, formulations of the esters of growth-regulating herbicides, application volume rates, weed control in clovers, lucerne, seedling grasses, sugar beet and sports turf, are considered in the research reports. This section also includes reviews of work on some of the more troublesome common weeds.

Copies of the Proceedings are obtainable from The Conference Treasurer, Mr. W. A, Williams, Association of British Insecticide Manufacturers, Cecil Chambers, 86 Strand, London, W.C.2.

L.W.T.

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